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EXXON BACKGROUND SERIES

Middle East Oil and Gas

DECEMBER 1984

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1 A Position of Preeminence

2 The most impressive measure of the economic importance of the Middle East* is the size of its petroleum reserves. More than half of the world's proved oil reserves and about a quarter of its natural gas are judged to be in the region (Tables 1 and 2, and Figures 1 and 2).

Oil was discovered in Iran as early as 1908, but it was not until after World War II that sufficient reserves had been found and developed in the area as a whole for the Middle East to become a significant factor in world energy. Thereafter the region's production rose rapidly, from 1/2 million barrels a day (b/d) in 1945 to more than 1 million b/d in 1948 and 2 million b/d four years later. By 1952, it accounted for over one of every six barrels produced worldwide.

The rapid postwar growth in Middle East oil production was in response to surging demand in Western Europe and Japan, induced by the restoration and subsequent expansion of war-shattered economies. Reservoirs that had been discovered before the war were quickly brought into production, and intensive exploration soon led to new discoveries—including Ghawar, the world's largest oil field, in Saudi Arabia.

By 1965, the Middle East had displaced the United States as the world's largest crude oil producing area, and its output continued to increase. During the 1970s, it accounted for 30 percent of total world production. The dramatic oil price increases of 1973-74, incident to the Arab oil embargo, and the global recession of 1974-75 only temporarily interrupted the pattern of growth. By 1977 Middle East production had reached a high of 22 1/2 million b/d.

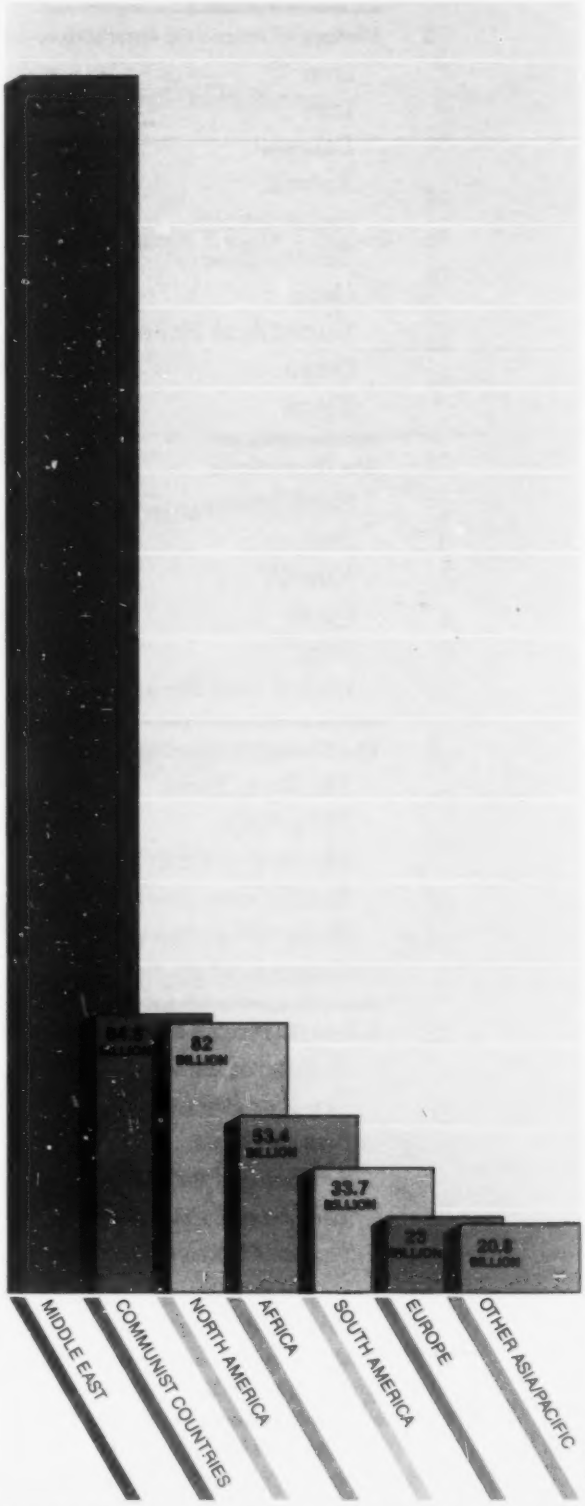
It remained near that level through 1979, when the Iranian crisis brought about a further series of price hikes. Only then did a significant retrenchment in the demand for Middle East oil emerge. Energy conservation and substitution measures —begun after the 1974 oil price increases, reinforced by the increases of 1979-80 and further strengthened by a worldwide recession in 1980 – resulted in a sharp decline in the demand for energy and especially for petroleum.

Moreover, those same price increases set in motion an intensified search for oil supplies in nations outside the Organization of the Petro-

Figure 1

World Distribution of Proved Oil Reserves

In Billions of Barrels, as of January 1, 1984



Source: Oil & Gas Journal

** The term "Middle East" in this publication refers to the countries surrounding the Arabian or Persian Gulf (as it is alternately known), plus Egypt.*

leum Exporting Countries (OPEC). This led to a significant expansion of non-OPEC oil production and to an offsetting drop in demand for OPEC oil—particularly from the six nations in the Middle East that accounted for about 60 to 70 percent of OPEC's total production. By 1983, Middle East crude oil production was down to just over 12 million b/d, or 2 million b/d less than the area had produced in 1970. It is unlikely, however, that production at such a low level will continue indefinitely. The world's need for energy is too great, and the region's reserves are too prolific.

By ordinary standards, Middle East oil fields are especially large and productive. At least 20 of them are expected ultimately to yield more than 5 billion barrels each. Seven had produced this amount by 1983.

High well productivity in the Middle East is attributable, principally, to two characteristics of its reservoir rocks: continuous thick (200 feet and more) intervals containing petroleum and unusually high permeability which permits the oil (and gas) to flow at high rates.

Actual production rates, however, have depended on market conditions. In 1980, for instance, average production per well in Saudi Arabia and Iraq exceeded 10,000 b/d. By 1983, after three years of declining world demand, this had fallen to 6,500 and 3,000 b/d, respectively. (See Table 3.) In comparison, the overall average well rate in the United States in 1980 was about 16 b/d (and 14 b/d in 1983).

Because of the economies of scale, as well as the proximity of fields to marine loading terminals, pre-tax costs per barrel of Middle East crude have been and continue to be low. This was the primary factor in the rapid increase in free world dependence on oil from this source in the years following World War II. It is a dependence that remains strong despite the manyfold increase in oil prices imposed by the members of OPEC since the winter of 1973-74 (Figure 3). Moreover, in the long run, it seems destined to grow.

The prospects for Middle East natural gas are less clear. Although the reserves are large, they have as yet not played a major role in world energy supply. Gross production in recent years has averaged only 10 to 11 billion cubic feet per day (cf/d), about 10 percent of total free world gas output. During this period, because of limited local demand and the high costs of moving natural gas over great distances to foreign markets, a half or more of Middle East gas productive capacity has gone unutilized (page 19).

Table 1

Middle East Oil Discoveries: Cumulative Production and Remaining Reserves

(Billions of Barrels)

Country	*Cumulative Production As of Jan. 1, 1984*	*Estimated Proved Reserves As of Jan. 1*				*Total Discoveries: (Reserves + Cum. Prodn.) As of Jan. 1, 1984*
		1950	1965	1980	1984	
Bahrain	0.7	0.3	0.3	0.2	0.2	0.9
Iran	31.8	13.0	38.0	58.0	51.0	82.8
Iraq	16.6	8.7	25.0	31.0	43.0	59.6
Kuwait*	23.0	15.0	69.3	68.5	66.8	89.8
Oman	1.9	–	0.5	2.4	2.8	4.7
Qatar	3.6	1.0	3.5	3.8	3.3	6.9
Saudi Arabia*	50.1	10.0	66.8	166.5	168.9	219.0
United Arab Emirates	8.6	–	7.7	29.4	32.3	40.9
Total Gulf Area	136.3	48.0	211.1	359.8	368.3	504.6
Egypt	3.0	0.2	1.5	3.1	3.5	6.5
Total Middle East	139.3	48.2	212.6	362.9	371.8	511.1
United States	*136.9*	*26.2*	*34.5*	*26.5*	*27.3*	*164.2*
Total World	*515.0*	*95.0*	*341.3*	*641.6*	*669.3*	*1,184.3*

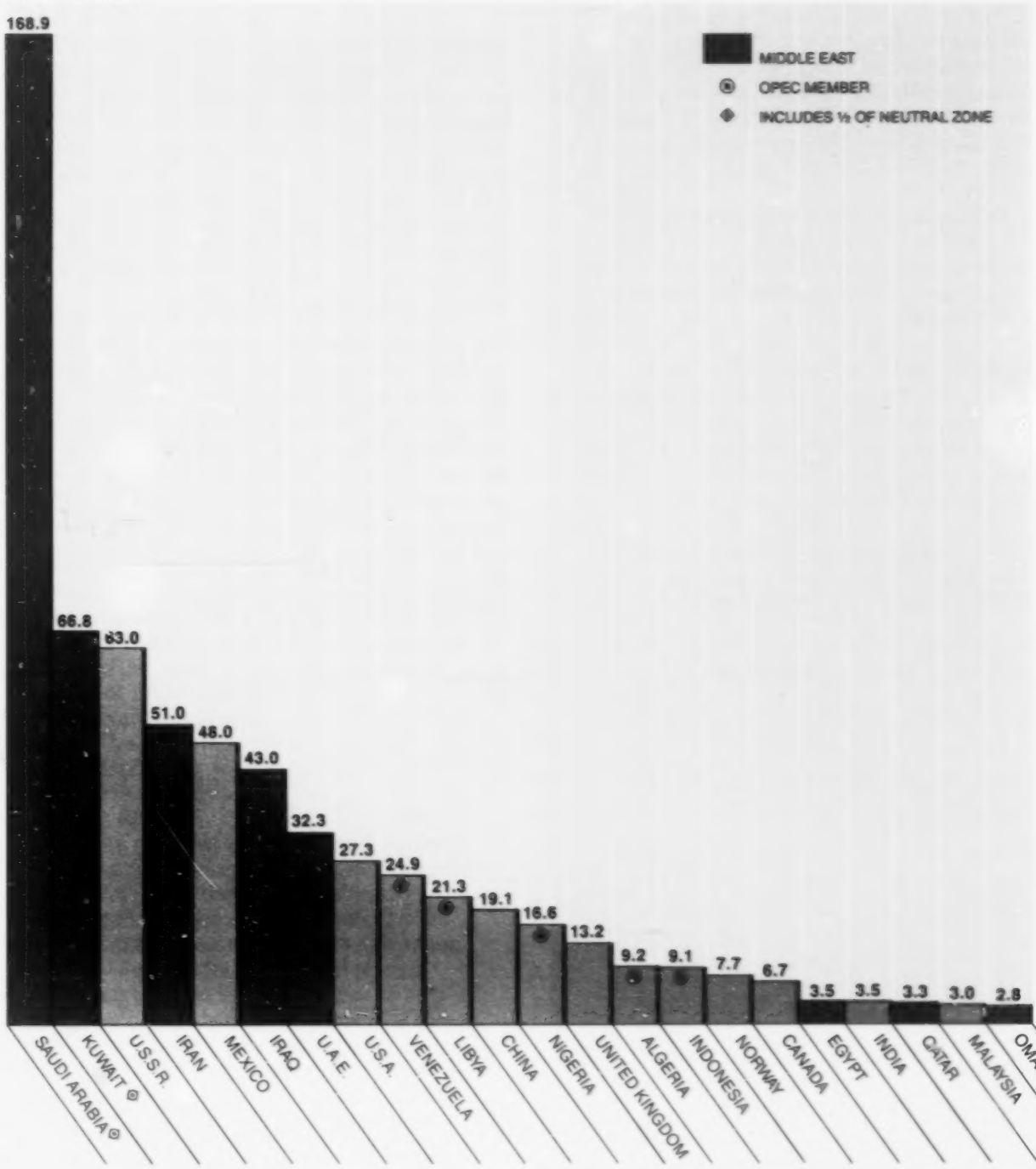
**Includes one-half of Neutral Zone.*

Sources: Oil & Gas Journal, World Oil, *Exxon Corporation estimates.*

Figure 2

Proved Oil Reserves of Middle East Nations

In Comparison with Other Principal Oil Producing Nations
As of January 1, 1984



Source: Oil & Gas Journal

2 History of Area's Oil Operations

European companies became involved in Middle East oil around the turn of the century, more than 25 years before U.S. companies appeared on the scene. The earlier interest of the Europeans was due not only to the proximity of Europe to the Middle East, but also to the fact that European countries, with the exception of Russia, produced little or no oil at the time. The United States, in contrast, was then producing 50 to 65 percent of the world's oil and supplying around 20 to 25 percent of non-U.S. demand in addition to its own rapidly-rising requirements.

In the first half of this century, foreign oil companies with interests in the Middle East, which by the 1930s included several American firms, combined their resources in joint exploration ventures. They did this to spread investment risks and to raise the large amounts of capital needed for operations in an area which, at the time, was remote and presented difficult operating and living conditions. Much of the oil produced in the Middle East still comes from areas which were in the original concessions granted to U.S. and European oil firms prior to 1940.

Table 2

Middle East Gas Reserves

As of January 1, 1984

Country	*Estimated Proved Reserves (Trillions of Cubic Feet)*
Bahrain	7
Egypt	7
Iran	480
Iraq	29
Kuwait	35*
Oman	3
Qatar	62
Saudi Arabia	125*
United Arab Emirates	31
Total Middle East	779
United States	*198*
Total World	*3,200*

**Includes one-half of Neutral Zone.*

Source: Oil & Gas Journal.

Table 3

Middle East Crude Oil Production

	Thousands of Barrels per Day						*1983*	
Country	*1950*	*1965*	*1975*	*1979*	*1980*	*1983*	*Producing Oil Wells*	*Daily Avg. Bbl/Well*
Bahrain	30	57	57	50	48	41	243	169
Iran	664	1,886	5,350	3,168	1,662	2,492	530	4,702
Iraq	136	1,322	2,262	3,477	2,514	922	290	3,179
Kuwait*	344	2,351	2,087	2,497	1,661	1,076	755	1,425
Oman	–	–	341	295	282	376	477	788
Qatar	34	231	437	508	471	295	125	2,360
Saudi Arabia*	547	2,206	7,075	9,535	9,903	5,062	780	6,490
United Arab Emirates	–	282	1,694	1,831	1,702	1,119	399	2,805
Total Gulf Area	1,755	8,335	19,303	21,361	18,243	11,383	3,599	3,163
Egypt	45	125	231	525	595	689	500	1,378
Total Middle East	1,800	8,460	19,534	21,886	18,838	12,072	4,099	2,945
United States	*5,407*	*7,804*	*8,362*	*8,533*	*8,597*	*8,680*	*636,900*	*14*
World	*10,428*	*30,308*	*53,418*	*62,658*	*59,464*	*52,621*	*NA*	*NA*

**Includes one-half of Neutral Zone.*

NA = Not Available.

Sources: International Petroleum Annual, *U.S. Bureau of Mines*; International Energy Statistical Review, *U.S. Central Intelligence Agency*; Oil & Gas Journal.

Beginning in the mid-1950s, other oil and non-oil companies—including some from Japan as well as new ones from the U.S. and Europe—joined in the Middle East search for oil. By the early 1970s, over 100 companies had become active in the area. Some of them were granted new concessions. Others bought into existing ventures of the original concession owners or acquired portions of concession areas that had been relinquished by the companies that first explored the region.

The phenomenal success of Middle Eastern exploration efforts over the years is depicted in Figure 4. After a relative lull during World War II, the rate of discovery reached its peak in the 1945-49 period, when the fabulous 60 billion barrel Ghawar field was discovered in Saudi Arabia. In the five years beginning with 1970, however, the rate of additions to Middle East oil reserves dropped sharply, bringing the world rate not only below previous periods but also below the rate of world oil production.

Iran

In Iran, or Persia as it was then known, the search for oil began late in the 19th century, but was unsuccessful. In 1901, William D'Arcy, a British entrepreneur who had made a fortune in Australian gold mining, received an exploration concession from the ruler which covered the entire country except for five northern provinces. After seven years of arduous but fruitless effort, D'Arcy and his associates were about to abandon the search when they discovered oil in commercial quantities near the head of the Gulf at Masjid-i-Suleiman. In 1909, the D'Arcy group formed Anglo-Persian Oil Company Ltd., and the first shipments of oil from the Middle East were made in 1912 from Abadan.

In those early years, oil from Persia did not have a major impact on the world petroleum scene, although it was used to fuel British naval and merchant ships operating east of Suez. With the outbreak of World War I, however, Persian production assumed sudden importance as a secure source of fuel for the British Navy. At the urging of Winston Churchill, then First Lord of the Admiralty, the British government in 1914 acquired a majority interest in Anglo-Persian. Production and refining capacity was tripled to meet the demands of the war.

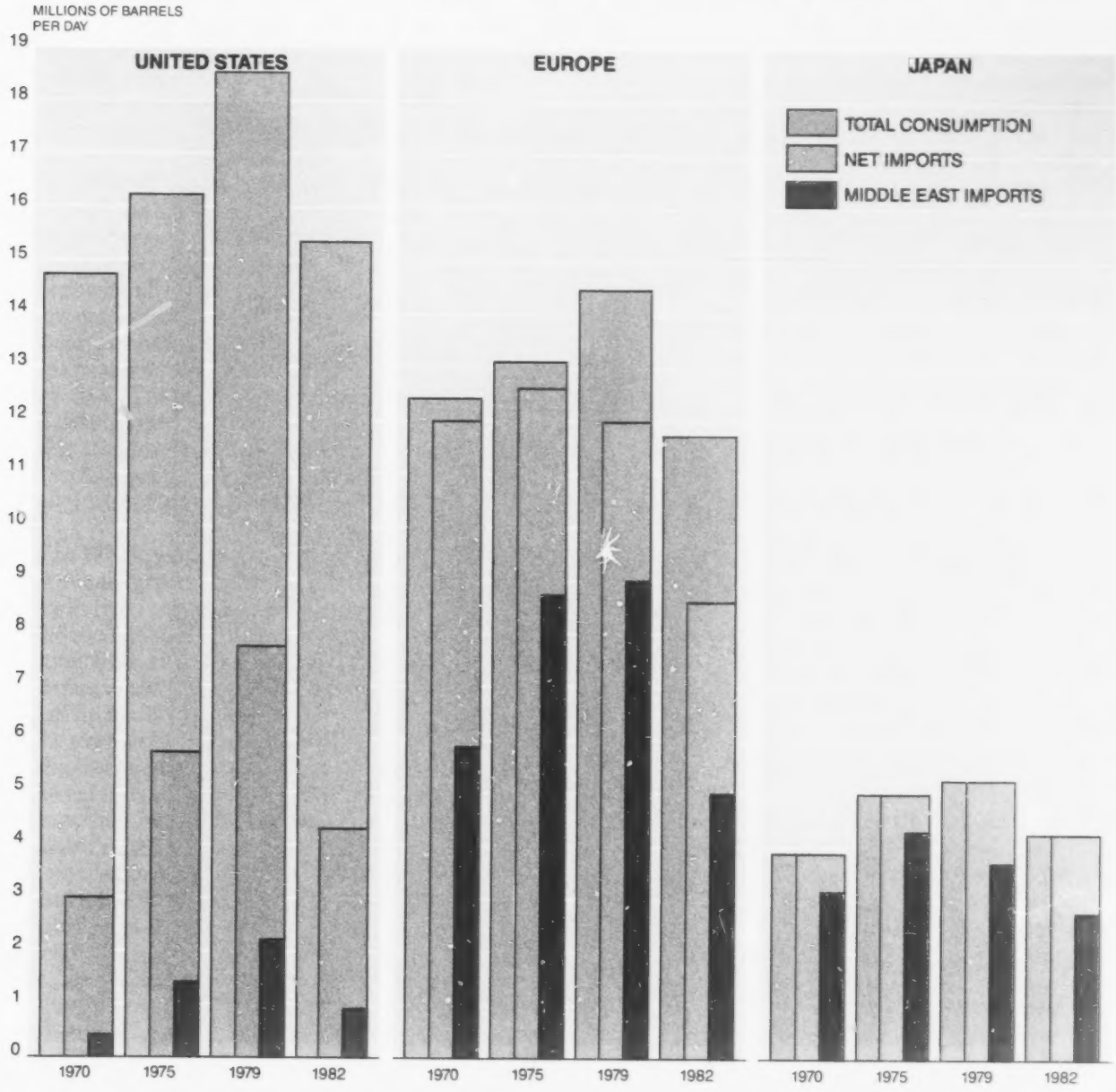
By 1938, after Persia's name had been changed to Iran and Anglo-Persian had become Anglo-Iranian Oil Company Ltd., production amounted to 21[illegible],000 b/d. As military needs again became paramount during World War II, both producing and refining facilities were further enlarged with the aid of American lend-lease funds. After the war, production continued its rapid expansion, rising to more than 700,000 b/d by the beginning of 1951 and accounting for nearly half of all Middle East production at the time. However, operations were disrupted later that year by the culmination of a prolonged dispute between Anglo-Iranian and the Government of Iran over a revision of concession terms.

A tentative agreement that had been reached earlier was rejected in March 1951 by Premier Mohammed Mossadeq and the Iranian Majlis (Parliament), which then nationalized Anglo-Iranian's operations. The National Iranian Oil Company (NIOC) was created to take over the nationalized properties, including the Abadan refinery, by then the world's largest, as well as the oil fields. The new company immediately encountered problems, owing to the unwillingness of established international oil companies to process or market the expropriated oil.

After the Mossadeq regime was forced out by supporters of Shah Reza Pahlavi in August 1953, the U.S. Government asked a group of U.S. international oil companies to form a consortium with British, French and Dutch interests in order to restore Iranian oil to world commerce. In October 1954, the consortium, Iranian Oil Participants Ltd. (IOP), and the new Iranian government reached an agreement under which the consortium would conduct operations for, and share revenues with, NIOC. The original concession holder, Anglo-Iranian—which by then had changed its name to British Petroleum Company (BP)—acquired 40 percent of the new consortium. American companies (five majors, including Exxon Corporation, with 7 percent each, and a group of smaller companies with 5 percent) obtained another 40 percent, and the remaining 20 percent was divided between the Royal Dutch/Shell Group of Companies (14 percent) and Compagnie Francaise des Pétroles (CFP) (6 percent). Following the 1954 agreement, production in Iran resumed its steady rise.

Figure 3

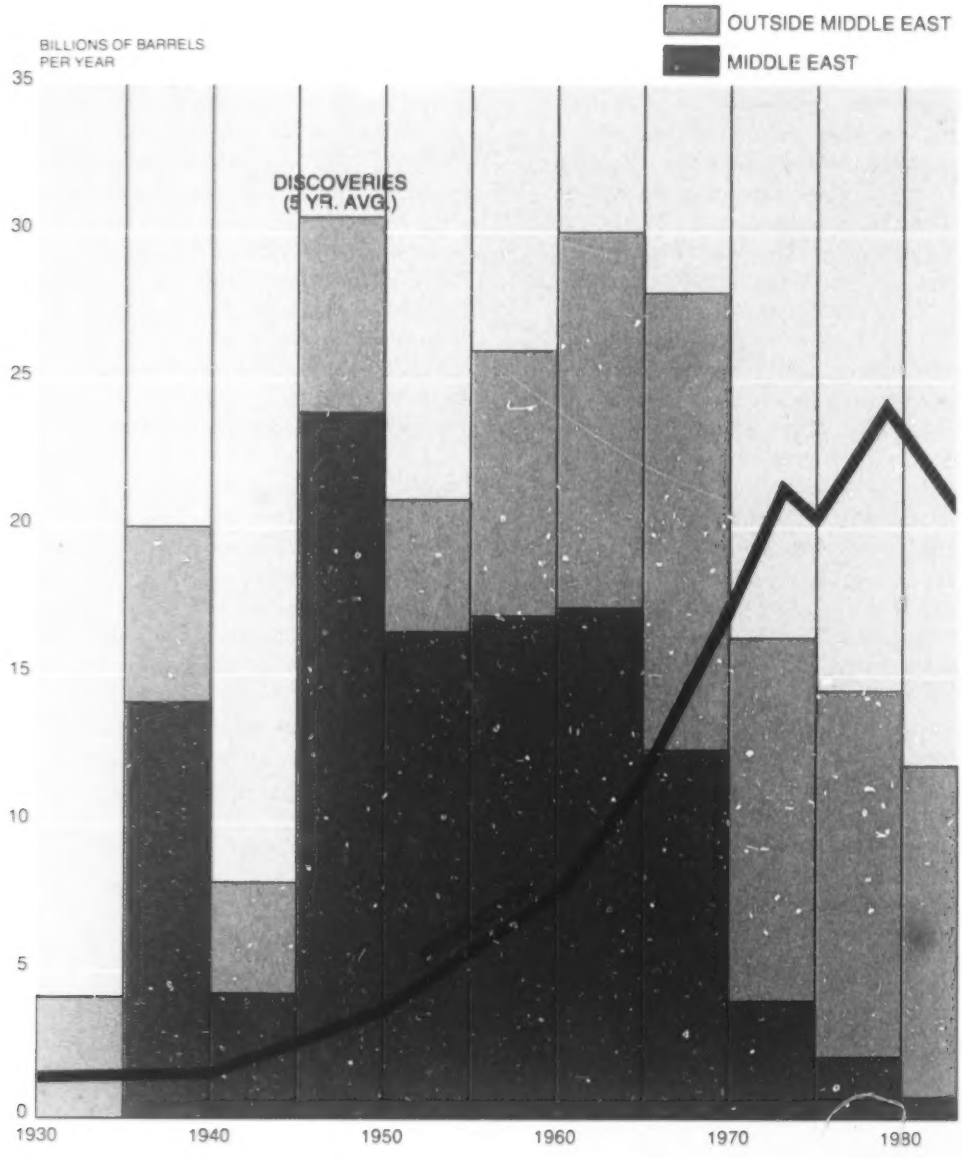
Changes in the Oil Imports* Dependence of Principal Industrialized Nations



*Crude oil and petroleum products combined.
Source: Exxon Corporation estimates

Figure 4

Rates of Discovery and Production of Total World Oil Reserves



** 1980-83 rate is average for 4-year period.*
Source: Exxon Corporation estimates

After 1957, NIOC entered into agreements with a number of private and government-owned companies from the United States, Europe, India and Japan, granting them rights to explore and develop offshore acreage in the Gulf not covered by the agreement with IOP. The agreements provided for either fifty-fifty joint ventures with NIOC or arrangements whereby the outside party acted as a contractor for NIOC.

In July 1973, the Iranian government, NIOC, and each of the IOP shareholder companies entered into a 20-year agreement to replace the 1954 agreement. Under the 1973 agreement, NIOC took over all operating responsibility within the areas covered by the 1954 agreement. Oil Service Company of Iran (OSCO) was established by IOP to act as operator under the direction and control of NIOC. The consortium companies were given rights to purchase all the crude oil produced in this area for 20 years, except quantities required for consumption within Iran and certain stated quantities for direct export by NIOC.

The 1973 agreement was structured as a sale and purchase arrangement and, therefore, differed in form from participation agreements (see page 26) concluded about the same time between oil companies and other producing country governments in the Gulf area. It was intended that the net financial consequences would be comparable. As a consequence of the continuing changes in the international oil markets, the Iranian government became dissatisfied with its share of oil revenues. In 1975 it initiated discussions to modify the 1973 agreement, and intermittent negotiations were held between the companies and NIOC from 1976 until the time of the Iranian revolution. No final resolution was achieved, however. The revolution brought strikes and civil disorder which disrupted oil production, causing a short interruption in exports of crude oil from Iran beginning in December 1978.

Just prior to that time, Iran's total production had approximated 5.2 million b/d, 90 percent of which came from onshore properties operated by NIOC. The balance came from four non-consortium offshore producing areas in the Gulf.

Early in 1979, NIOC unilaterally repudiated the 1973 agreement, assumed all operations previously assigned to OSCO, and declared new, lower levels for crude production and for exports. Crude exports were resumed in March 1979. The Iranian government established a maximum production target of 4 million b/d for the remainder of 1979, a figure which would allow about 3.3 million b/d for export. Actual production turned out to be 3.1 million b/d while exports fell to less than half the prerevolutionary level. In November 1979 the U.S. Government imposed a freeze on Iranian assets when the U.S. Embassy in Teheran was seized and its personnel held as hostages. Iran responded by suspending all crude deliveries to U.S. oil companies, regardless of the ultimate destination of the oil. In the first six months of 1980, exports dropped still further, due largely to the substantial surcharges Iran imposed on its crude oil.

The outbreak in September 1980 of the war between Iran and Iraq and fighting in the oil producing province of Khuzestan occasioned another reduction in Iran's oil production. For the year as a whole, it fell to an average of 1.5 million b/d, a drop of over 50 percent from 1979, and in 1981 it slipped further to 1.3 million b/d before recovering in 1982. By 1983, Iran's production was reported to be up to around 2.6 million b/d.

Iraq

Competition among rival European entrepreneurs for oil exploration rights in Iraq began early in this century. Turkish Petroleum Company (TPC), formed before World War I and eventually owned by British, French and Dutch interests, began exploration in northern Iraq after the war. In the 1920s, amid talk of an oil shortage in the U.S., the State Department urged the British and French governments to provide American companies "equality of commercial opportunity." The American objective was to obtain exploration and producing rights in Iraq near discoveries that had been made in neighboring Iran.

In October 1927, during the course of the negotiations aimed at introducing an American interest into TPC, oil was discovered in what was to become one of the great oil fields of the world: Kirkuk. This heightened American enthusiasm for the venture.

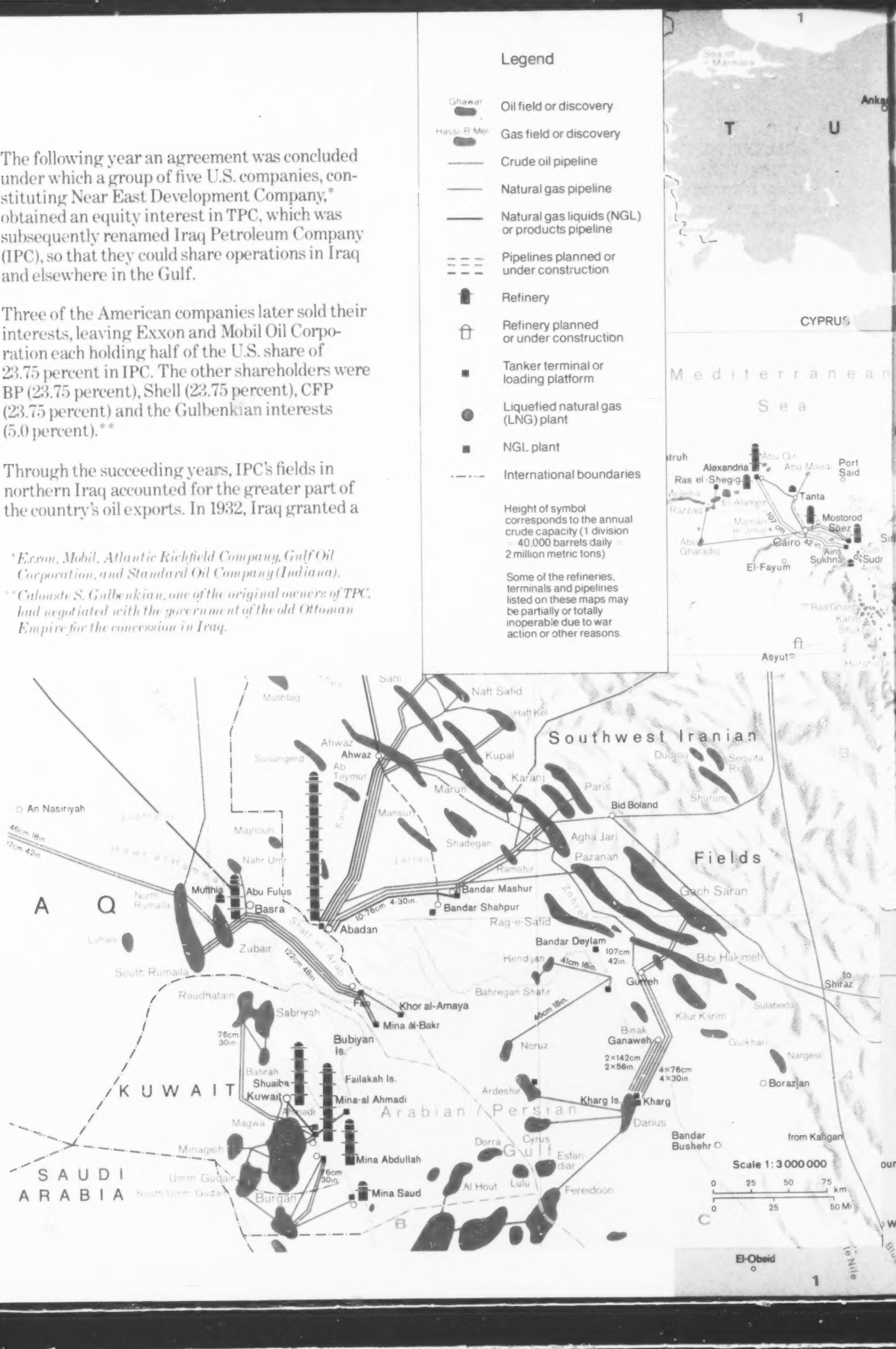
10 The following year an agreement was concluded under which a group of five U.S. companies, constituting Near East Development Company,* obtained an equity interest in TPC, which was subsequently renamed Iraq Petroleum Company (IPC), so that they could share operations in Iraq and elsewhere in the Gulf.

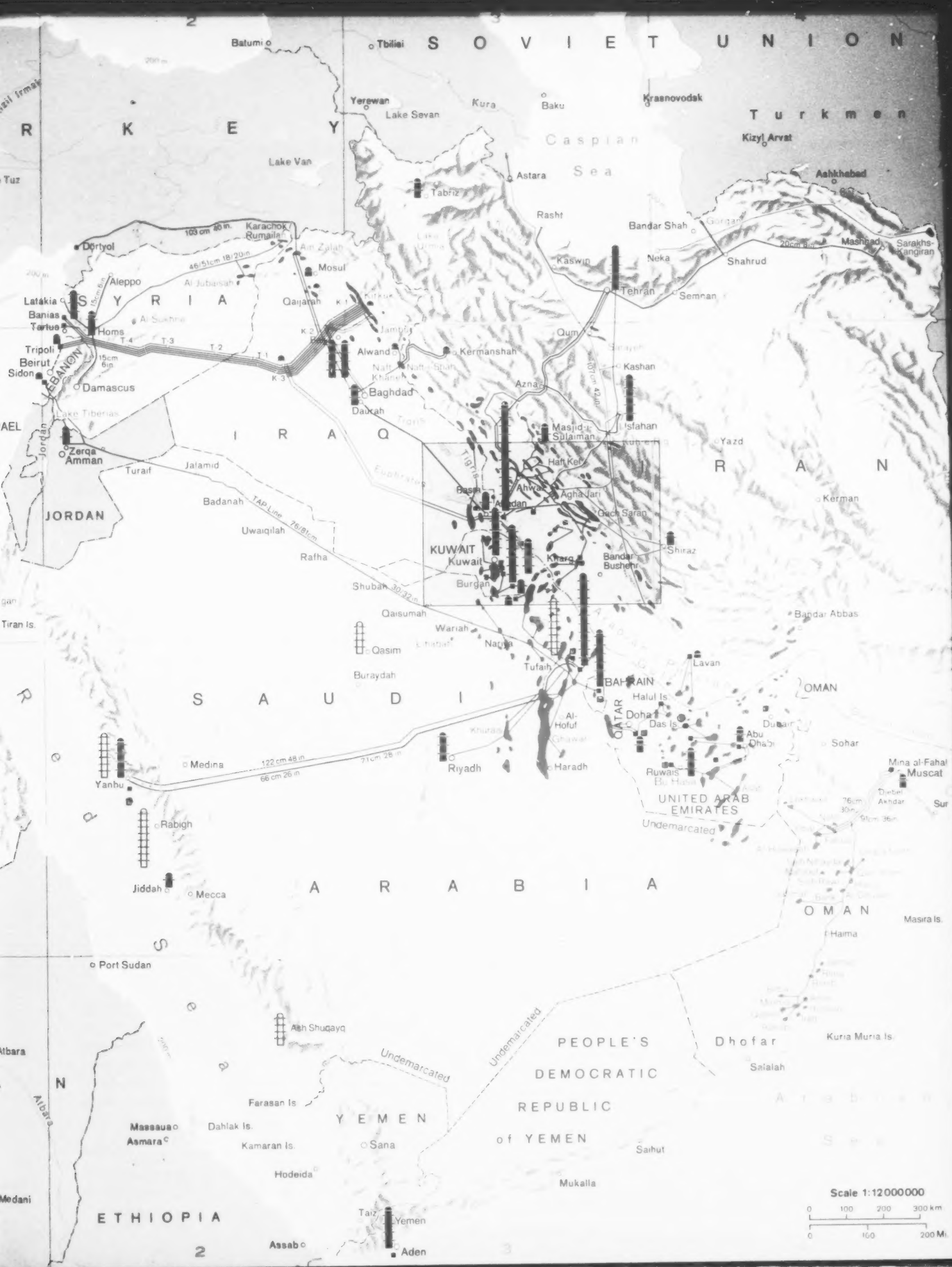
Three of the American companies later sold their interests, leaving Exxon and Mobil Oil Corporation each holding half of the U.S. share of 23.75 percent in IPC. The other shareholders were BP (23.75 percent), Shell (23.75 percent), CFP (23.75 percent) and the Gulbenkian interests (5.0 percent).**

Through the succeeding years, IPC's fields in northern Iraq accounted for the greater part of the country's oil exports. In 1932, Iraq granted a

Exxon, Mobil, Atlantic Richfield Company, Gulf Oil Corporation, and Standard Oil Company (Indiana).

**Calouste S. Gulbenkian, one of the original owners of TPC, had negotiated with the government of the old Ottoman Empire for the concession in Iraq.*

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Tabriz
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Bandar Shah
Gorgan
Mashhad
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Ain Zalah
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Al Jubaylah
Kaswin
Neka
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Latakia
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Al Sukhnah
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Yazd
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Zerqa
Amman
Turaif
Jalamid
Hafr Kel
Basra
Ahwaz
Agha Jari
Gach Saran
Kerman
Badanah
TAP Line
Uwaiqilah
Rafha
JORDAN
KUWAIT
Kuwait
Kharg
Bandar Bushehr
Shiraz
Burgan
Shuban
Qaisumah
Wariah
Natiya
Bandar Abbas
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Das Is.
Dubai
Abu Dhabi
Sohar
Medina
Riyadh
Haradh
Ruwais
Mina al-Fahal
Muscat
Yanbu
UNITED ARAB EMIRATES
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Port Sudan
Ash Shuqayq
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concession for the area west of the Tigris River and north of the thirty-third parallel to a company that subsequently sold its interest to the owners of IPC. The new company came to be called the Mosul Petroleum Company (MPC). After an extensive exploration effort, oil in commercial quantities was discovered at Ain Zalah in 1939 and later at Butmah.

In 1938, a third company, Basrah Petroleum Company (BPC), also owned by the IPC group, was granted a concession covering the southern part of Iraq. BPC began production in 1951 from the Zubair discovery and later developed the Rumaila field.

In the late 1950s, following the overthrow of the monarchy, relations between the oil companies and the Iraqi government became strained. After several years of fruitless negotiations regarding acreage relinquishment, government participation in ownership and other issues, the situation came to a head in 1961. In December of that year, the government expropriated, without compensation, more than 99.5 percent of the total concession areas held by Iraq Petroleum and its associated companies, leaving the companies free to operate only in the limited areas where wells were then in actual production. Attempts to settle the dispute by arbitration, as provided in the concession agreements, were frustrated by the government's unwillingness to name its arbitrator.

After two years of negotiations, the companies and the Iraqi oil minister, with the approval of a ministerial committee set up for the purpose, reached a compromise agreement in July 1965. The agreement included provision for a joint exploration venture by the government and the companies in the disputed areas. However, a coup in 1966 brought to power a new government which did not approve the agreement, and negotiations were terminated. In 1967, the government assigned exclusive rights with respect to the expropriated acreage to the state-owned Iraq National Oil Company (INOC). Subsequently, INOC reached an agreement with the French government company, Entreprise de Recherches et d'Activities Petrolieres (ERAP), under which the latter would explore and develop a portion of the area on a contract basis.

In June 1972, the Iraqi government nationalized the remaining IPC concession areas, consisting almost wholly of producing properties. A settlement was negotiated in February 1973, and IPC received compensation for its properties. At the same time, the MPC interests were relinquished because the owners were unable to meet the minimum production rate specified in the terms of the concession.

In October 1973, following the outbreak of the fourth Arab-Israeli war, Iraq began nationalizing portions of the BPC operations. Percentages corresponding to the interests of Exxon and Mobil, 60 percent of Shell's interest (corresponding to the Dutch share in Shell's holdings), and the 5 percent share held by Gulbenkian's Participation and Exploration Company were successively taken. These actions were directed against companies whose home governments were considered by Iraq to be supporting Israel. Two years later, in December 1975, Iraq nationalized the British and French interests in BPC operations. It was not until March 1979 that an agreement was reached between BPC and the government arising out of these nationalizations.

Iraq has substantial proven crude oil reserves (Figure 2), and its undiscovered potential is considered to be among the most promising in the Middle East. By late 1979 actual production had reached 3.7 million b/d. For 1979 as a whole—the last full calendar year prior to the war with Iran—Iraqi crude oil exports averaged approximately 3.3 million b/d, up by more than one-third over 1978, helping to offset the lower levels of Iranian exports.

Iranian military action in the war, which broke out in September 1980, destroyed Iraq's export facilities in the Gulf and caused a sharp cutback in production; output of less than 1 million b/d during the final quarter brought the average for all of 1980 down to about 2.5 million b/d. The continuation of the Iran-Iraq war and the denial by Syria and Lebanon of pipeline shipments of Iraqi crude across their territory to their Mediterranean ports of Banias and Tripoli, respectively, limited Iraq's production to about 1 million b/d in the ensuing three years.

Three separate pipeline systems had been used in the past to transport Iraqi crude to eastern Mediterranean and Gulf export terminals. In early 1980, after Lebanon and Iraq failed to agree on transit fees, exports were halted through the Lebanon branch of the 1.1 million b/d line running from Kirkuk in the north to Syria and Lebanon. In April 1982 all crude movements across Syria were also discontinued as a result of disagreements between Syria and Iraq arising

out of the Iran-Iraq war, in which Syria has sided with Iran. A north/south line of 1 million b/d capacity, built within Iraq to provide outlets to both the Gulf and the eastern Mediterranean, could only be used to ship oil north after Iraq's main export terminals on the Gulf, Khor-al-Amaya and Mina-al-Bakr, were destroyed in 1980. This left Iraq with only one crude export route: the 1 million b/d line from Kirkuk to the Mediterranean through Turkey, terminating at the port of Dortyol. To increase its export capacity, the Iraqi government in mid-1984 was considering building three new pipelines, one via Saudi Arabia and a second through Jordan that would give Iraq alternative outlets via the Red Sea, and a third paralleling the existing line through Turkey.

Bahrain

The discovery of major reserves of oil in Iran and Iraq stimulated exploration elsewhere in the Middle East, including the island of Bahrain, 25 miles off the Gulf coast of Saudi Arabia. Bahrain Petroleum Company (BAPCO), then a wholly owned subsidiary of Chevron Corporation, struck oil with its first well in 1932. Four years later, Texaco, Inc. acquired a 50 percent interest in BAPCO. Production began at a modest level in the mid-1930s and remained below 40,000 b/d until 1958. A maximum level of 77,000 b/d was reached in 1970.

In November 1974, the Bahraini government acquired a 60 percent interest in BAPCO's producing operations. In early 1980 the government increased its ownership to 100 percent. Bahrain also shares equally with Saudi Arabia the revenue from the offshore Abu Safah field, which lies astride their boundary. While Bahrain has come to depend heavily on oil exports as a source of revenue, its crude production has never been a major factor in the Middle East total. Moreover, output has fallen from the 1970 peak and in mid-1984 was running around 40,000 b/d.

A small refinery was constructed in 1936; expanded over the years, it became one of the region's largest at 265,000 b/d capacity, processing crude oil delivered by pipeline from Saudi Arabia as well as local production. In 1980, the government acquired a majority interest in the refinery from BAPCO.

Kuwait

Kuwait Oil Company (KOC), owned in equal shares by Gulf Oil Corporation* and BP, obtained a concession in Kuwait in 1934 and discovered in 1938 the prolific Burgan field, one of the world's largest. Its development was interrupted by World War II, however; the first export shipment of Kuwaiti crude oil was not made until 1946. Two other fields were discovered in the mid-1950s, increasing the growth rate of Kuwaiti crude oil production during that decade to 17 percent per year, the fastest in the world.

This rate of increase reflected Kuwait's low costs of both production, due to the relative ease of recovering its crude, and transportation, due to the proximity of its oil fields to export loading facilities.

Like other Gulf producing country governments, the Kuwaiti government in the early 1970s began negotiations with the oil companies for participation (see page 26) in the ownership of Kuwaiti oil fields. An agreement for 25 percent government participation was reached with KOC in late 1972, but the National Assembly declined to ratify it. Further negotiations took place, leading to a revised agreement which was ratified in May 1974 and provided for 60 percent government participation in KOC retroactive to January 1, 1974. In 1975, the government acquired 100 percent of the properties and worked out arrangements for BP and Gulf Oil to lift about 950,000 b/d over five years.

Tiny Kuwait was third in production among exporting countries in the Gulf during the 1970s, surpassed only by Saudi Arabia and Iran. But the trend of production during the decade was nevertheless down, reflecting a government policy of conserving reserves. By 1979, output had fallen to an average of 2.5 million b/d from a peak of 3.3 million b/d in 1972. Beginning early in 1980, the government reduced production ceilings further, because of reduced world oil demand as well as the continuance of its conservation policy. As a consequence, production fell in ensuing years to an average of around 1 million b/d.

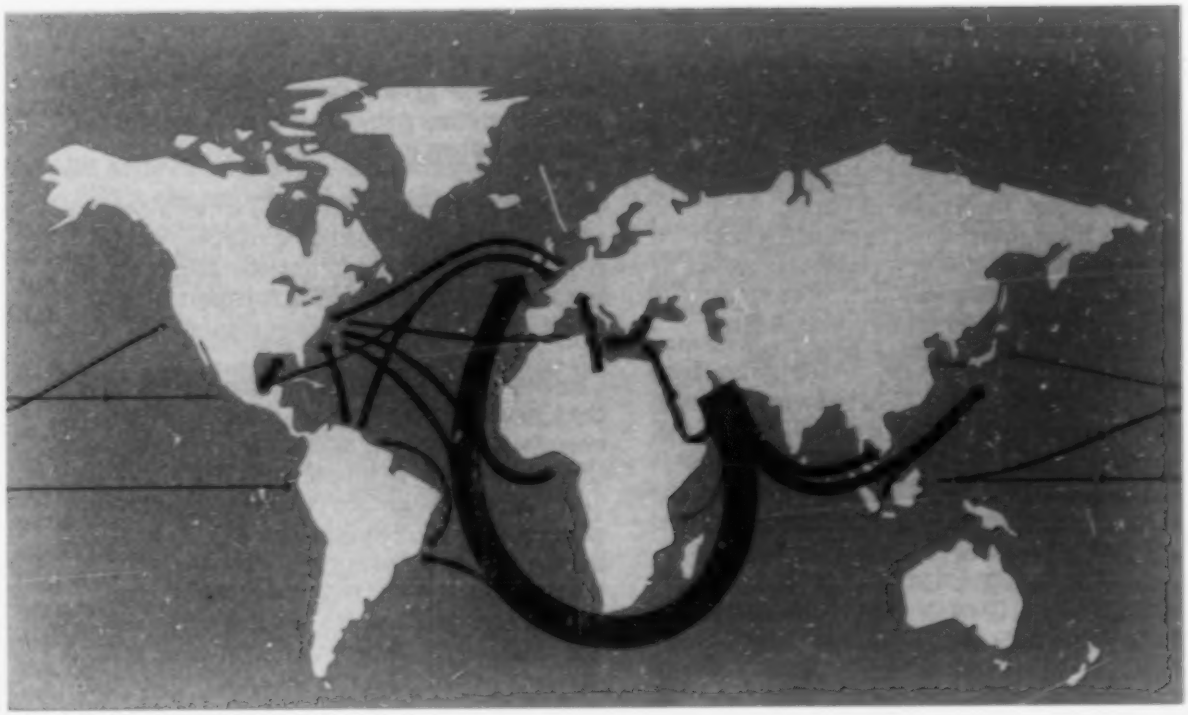
Saudi Arabia

Although by now well known as the nation with the most proved oil reserves, Saudi Arabia was not known to have oil until the 1930s. It was not until long after the first—unsuccessful—exploration efforts by a British syndicate in 1923-24 that the magnitude of the country's petroleum wealth became apparent.

**Acquired by Chevron in mid-1984.*

Figure 5

Principal Oil Movements by Sea—1983



Encouraged by the Chevron discovery in nearby Bahrain in 1932, the IPC group pursued concession rights in Saudi Arabia. But it was outbid by Chevron. In 1933, King Abdul Aziz ibn Saud granted Chevron a concession covering a large area in eastern and central Saudi Arabia. This was later extended offshore into the Gulf. Texaco joined Chevron's Saudi venture in 1936 at the time it bought into Chevron's Bahrain operations. In 1938, the company later to be named Arabian American Oil Company (Aramco) made the first important oil discovery in the Eastern Province of Saudi Arabia, at Dammam.

The first tanker cargo of Saudi Arabian crude was shipped in May 1939, but World War II began the following September, gradually bringing Aramco's operations to a halt. Shipping became difficult, tanker shortages were common, military action made some markets inaccessible, and there was little demand for oil in the Indian Ocean area. Operations continued only to the extent needed to supply about 15,000 b/d to the refinery in Bahrain.

By the autumn of 1943, the United States Government became concerned that wartime petroleum requirements were seriously draining American oil fields. Accordingly, the government decided to allocate the necessary materials for a 50,000 b/d refinery at Ras Tanura to process Saudi crude. Construction proceeded despite wartime logistical problems, and the refinery was completed and placed in operation in the fall of 1945.

In the immediate postwar period, further exploration in Saudi Arabia quickly indicated the area's huge potential and culminated in the 1948 discovery of the 150-mile-long Ghawar field. Exploration also made clear that development would require a massive infusion of capital, men and equipment. In the face of such requirements, Aramco's two original shareholders, Chevron and Texaco, were receptive to admitting other participants in their venture. At the same time, surging postwar demand for oil caused other major international petroleum companies to feel an increasing need for new sources of crude.

Exxon and Mobil started negotiations to acquire equity in Aramco in 1946 and worked out a preliminary agreement with Chevron and Texaco in 1947. The arrangements were concluded late in 1948. Exxon acquired a 30 percent equity interest in Aramco, and Mobil, 10 percent. Chevron and Texaco each retained 30 percent.*

Aramco's production increased rapidly, rising from about 500,000 b/d in 1949 to more than 3 million b/d in 1969. During the 1970s, it escalated even faster; by 1978, Aramco crude production averaged over 8 million b/d. While the government had established a maximum allowable for Aramco in the mid-1970s of 8.5 million b/d, in 1979 it increased the allowable to 9.5 million b/d as a temporary measure when Iran's crude exports were cut back as a result of that country's revolution. Throughout most of the subsequent two years, average production remained around the higher allowable level. Total Saudi production, however, dropped to 6.3 million b/d in 1982 and to just over 5 million b/d in 1983 in response to the decline in world oil demand.

Of the four grades of Saudi crude oil – Arabian Extra Light, Light, Medium and Heavy – Arabian Light is of special significance. Since 1971, it has functioned as a "marker" crude oil, serving as the standard in relation to which other Gulf and later all OPEC crudes have been priced.

The principal sources of Arabian Light are the Ghawar and Abqaiq fields in the east central part of the country. Arabian Medium crude comes mainly from two offshore fields, Zuluf and Marjan. Arabian Heavy is produced from the offshore Safaniyah and Manifa fields, and Arabian Extra Light comes from the offshore Berri field.

The bulk of Saudi crude production is exported via the Gulf in tankers loaded at Ras Tanura, the nation's original oil terminal, and the nearby offshore terminal at Ju'aymah. Since mid-1981, when a pipeline from the Eastern Province to the Red Sea was completed, substantial quantities of crude have also been exported from the western terminal of Yanbu. (See map on page 11.)

In April, 1975, Mobil arranged with Aramco to increase its ownership of Aramco to 15 percent over a five-year period. Thus, as of May 1979, the Exxon, Chevron and Texaco interests were correspondingly reduced to 28$\frac{1}{2}$ percent each. This division of share ownership was not affected when the Saudi Arabian government acquired substantially all of Aramco's assets and operations in 1980.

In earlier times, considerable volumes of Saudi crude had been moved to the eastern Mediterranean through the 30-inch diameter Trans-Arabian Pipeline (Tapline) across Saudi Arabia, Jordan and Syria to a tanker terminal at Sidon in Lebanon. Completed in 1950, the line was built to reduce transportation costs to Europe by eliminating the long haul around the Arabian Peninsula (Figure 5). However, the development and increased use of very large crude carriers (VLCCs)* and the decline in tanker rates made Tapline oil shipment uncompetitive with other oil routes, beginning in 1975. For that reason, as well as the unsettled political situation in Lebanon, there have been no regular Tapline exports from Sidon since that year. Tapline does, however, continue to supply Saudi crude oil to Jordan to meet some of its internal requirements.

Under the 1972 General Agreement on Participation (discussed in more detail on page 26), a 25 percent interest in the crude oil producing operations of Aramco was acquired by the Government of Saudi Arabia. Its interest was increased to 60 percent, effective January 1, 1974, and in mid-1974 the government made known its desire to acquire substantially all of Aramco's assets and operations. By 1980 the acquisition was completed. The arrangements covering the government's acquisition of assets provide Aramco a significant role in operating the oil fields for the government, as well as access to substantial volumes of Saudi crude oil.

At the urging of the government, the scope of Aramco operations in Saudi Arabia broadened considerably in recent years to include participation in non-oil activities, such as the electrification of the Eastern Province, as well as major petroleum-related ventures. Aramco has operated massive water injection facilities to maintain the reservoir pressure of several oil fields; it also has undertaken the construction of a crude and natural gas liquids (NGL) terminal and tankage at Yanbu and the huge Saudi master gas system (see page 22).

Neutral Zone

The Neutral Zone (also known as the Divided Zone or Partitioned Zone) is an area of some 3,560 square miles between Saudi Arabia and Kuwait which was established by their rulers in 1922. Under their treaty, resolving a boundary dispute between them, they agreed to share

*300,000–320,000 dead weight tons (dwt)

equal rights in the territory. Bidders for oil rights began to be invited in the mid-1940s. In 1971, the two countries divided the zone geographically for administrative purposes, into northern (Kuwaiti) and southern (Saudi Arabian) portions. However, they retained equal interest in all petroleum that had been discovered in the interim or would be discovered in the future.

The two governments granted oil concessions in the zone to three companies. In 1948, Kuwait granted its onshore rights to American Independent Oil Company (Aminoil), formed by a group of major and independent companies. Saudi Arabia's onshore rights were conveyed in a 1949 concession to Getty Oil Company.* The rights to the entire Neutral Zone offshore area were acquired from the two countries in 1957-58 by Arabian Oil Company Ltd. (AOC), a Japanese firm organized by a group of Japanese industrial, utility and other companies.

Aminoil, which was operator for all onshore operations for the first several years, discovered the zone's first oil in 1953 at Wafra, about 20 miles south of Kuwait's Burgan field. Later, Aminoil and Getty formed a joint operating committee, staffed by both companies, which jointly carried out exploration and development and operated the gathering facilities. Pipelines, refining, and export activities remained separate.

In 1961, AOC made its first discovery in Gulf waters at Khafji, which is a northern extension of Saudi Arabia's Safaniya field, the largest offshore field in the world. Aminoil's interests were nationalized by the Kuwaiti government in 1977.** Getty continues to produce in the zone, moving the oil by pipeline to its refinery at Mina Saud in Kuwait.

Production from the Neutral Zone—divided fifty-fifty between Kuwait and Saudi Arabia—rose through the years until it peaked at about 570,000 b/d in 1979. By 1982, output had fallen to an average of about 315,000 b/d; in 1983, it recovered to just under 400,000 b/d.

Qatar

Qatar occupies a peninsula of about 4,000 sq. mi. jutting from the Arabian mainland northward into the Gulf. In 1935, Qatar Petroleum Company (QPC), one of the IPC group, obtained a 75-year concession for the entire onshore territory. In 1940, QPC discovered the Dukhan field on the west coast and, after a war-imposed delay, began production in 1949. The concession for Qatar's offshore areas was granted in 1952 to Shell, which discovered the Idd El Shargi field in 1960 and Maydan-Mahzam and Bul Hanine in ensuing years. (In 1972, it also discovered very large non-associated gas reserves. See page 22.)

In late 1972, the Government of Qatar, along with those of other Gulf producing countries, undertook negotiations with the companies for participation in their oil operations (see page 26). By year-end, Qatar acquired a 25 percent interest and, in 1974, its share was increased to 60 percent. In 1975, Qatar asked that the level be raised to 100 percent, and in the following year an agreement to that effect was concluded with QPC. A similar agreement was executed by Shell in 1977. Both concessions were transferred to Qatar General Petroleum Corporation (QGPC), which assigned operations to two divisions, QGPC Onshore Operations and QGPC Offshore Operations.

In conjunction with the government's 100 percent participation, the QPC shareholders established Dukhan Service Company to provide services to QGPC Onshore Operations. The QPC shareholders also signed a crude purchase contract with QGPC. Similar arrangements were made by Shell with QGPC Offshore Operations.

Qatar's total crude oil production peaked in 1973 at 570,000 b/d, dropped in response to declining world demand in the following years, rose again to 500,000 b/d in 1979, and subsequently fell again, dropping below 300,000 b/d in 1983. Production has been about evenly divided between onshore and offshore fields.

United Arab Emirates

The seven Arab sheikhdoms on the southern coast of the Gulf, formerly known as the Trucial States, constitute the United Arab Emirates (UAE), a federation formed in 1971 with the termination of the treaties under which Britain had been responsible for their defense and foreign relations. Of the seven, two—Abu Dhabi and Dubai—are significant oil producers, and a third, Sharjah, produces modest amounts. However, exploration activities are being carried out in all seven emirates.

*Acquired by Texaco in mid-1984.

**Aminoil had been acquired in 1970 by R. J. Reynolds Industries, Inc.

The ruler of Abu Dhabi granted its first oil concession in 1939 to Abu Dhabi Petroleum Company Ltd. (ADPC), owned by the IPC group. Having a term of 75 years, the concession covered all of Abu Dhabi's land area, coastal waters, and islands in the Gulf. The war in Europe and boundary disputes with Saudi Arabia, however, precluded intensive exploration and development until 1950. In 1960 ADPC discovered oil in commercial quantities at an onshore field called Bab, and exports of its crude—known as Murban—began in 1963.

A concession covering offshore areas apart from the islands and coastal waters had been granted in 1953 to Abu Dhabi Marine Areas Ltd. (ADMA), a company owned by BP and CFP, later joined by Japan Oil Development Company Ltd. Oil was discovered in this concession in 1958 at Umm Shaif; exports began in 1962.

In 1972 the government undertook participation negotiations with the oil companies (see page 26); by the beginning of the following year, Abu Dhabi National Oil Company (ADNOC) had acquired a 25 percent interest in the concessions. This was increased to 60 percent in 1974. Under the participation agreement, ADPC's shareholders and ADNOC established Abu Dhabi Company for Onshore Oil Operations (ADCO) to conduct all operations in the ADPC concession. Abu Dhabi Marine Operating Company (ADMA-OPCO) was established to conduct operations on behalf of ADMA and ADNOC.

About two-thirds of Abu Dhabi's production comes from onshore fields—Bu Hasa, Asab, and Bab, all operated by ADCO—and is exported from a terminal at Jebel Dhanna. Most of the country's offshore production comes from the Umm Shaif and Upper and Lower Zakum fields operated by ADMA-OPCO. The oil is pumped through underwater pipelines to a terminal on Das Island. Small additional volumes are produced from offshore fields developed by Japanese and European firms.

Total Abu Dhabi production exceeded an average of 1 million b/d by 1972 and peaked in 1977 at about 1.7 million b/d, but production restrictions and reduced world demand have lowered output and export levels in recent years. In 1981 the government imposed production limits. ADCO's initial production allowable was set at 740,000 b/d, down from a peak production level of 1 million b/d. ADCO's allowable has been reduced since to 500,000 b/d. ADMA's current allowable is 250,000 b/d. Thus, by 1983, total production from both offshore and onshore fields averaged just under 800,000 b/d—or less than half the peak rate.

Dubai, the second most populous sheikhdom in the UAE, is also the second largest producer of oil, all of it from offshore fields. Oil was discovered in 1966 by Dubai Marine Areas Ltd. (DUMA), a consortium of U.S. and European companies with Conoco Inc. as the operator. Production from the field, named Fateh, began in 1969. Other discoveries were made subsequently. Since the late 1970s, Dubai's production has been relatively stable at an average of about 350,000 b/d. Sharjah has been producing small quantities of oil since 1974, when its Mubarak offshore field was discovered by Buttes Gas & Oil Co. as operator for a group of companies. From a peak of 38,000 b/d in 1975, crude production from Mubarak dropped to about 10,000 b/d in 1983. However, the Sajaa gas condensate field, discovered in 1980 in East Sharjah, began production in mid-1982, and by mid-1984 condensate production had reached 55,000 b/d. In the other four emirates—Ajman, Fujairah, Ras al-Khaimah and Umm al-Qaiwain—exploration over the last decade has not yielded commercial crude oil reserves, but a substantial gas condensate reserve was discovered in Ras al-Khaimah.

Oman

After many years of exploration by a number of American and European companies, oil was discovered in the early 1960s at three locations in the desert of Oman, a sultanate on the southeastern tip of the Arabian Peninsula and the only significant Gulf producer which is not a member of OPEC. The discoveries were made by Petroleum Development (Oman) Ltd. (PDO), then a majority-owned subsidiary of Shell. Production began in 1967 and rose rapidly to 335,000 b/d by 1970. During the 1970s, over a dozen additional—but mostly small—fields were discovered across the country, and output from older fields was maintained by secondary recovery techniques and additional drilling. Also during that decade, the government obtained and increased its interest in petroleum company operations. Since 1970, production has fluctuated considerably, dropping below 300,000 b/d during the 1971-74 period, rising to around 350,000 b/d in 1976-77, and falling below 300,000 in 1979. In 1981, however, output turned up again, and in 1983 it reached a new peak of about 375,000 b/d.

Egypt

Centuries ago, oil seepages at Gebel el Zeit, near the mouth of the Gulf of Suez, earned that ridge the Roman name Mons Petroleus, but Egypt's first commercial oil well was not drilled until 1909, one year after the discovery well in Persia. In the decades since then, Egypt has been heavily explored—both on- and offshore—by many Egyptian and foreign companies. In spite of many dry holes and the effects of two world wars, four Arab-Israeli wars (including Israel's eight-year occupation of a region with several oil fields), and reversals in government policies toward foreign oil companies, sufficient oil has been found and developed to make Egypt the seventeenth largest crude producer in the world.

The first important field, Hurghada, was found in 1913, but little exploration, development or production occurred until highly restrictive government regulations were relaxed in 1937. U.S. and European companies then obtained permits and carried out extensive exploration, but this resulted in only one discovery, Gharib, on the west coast of the Gulf of Suez in 1938 before World War II curtailed their activities.

Exploration was resumed after the war and had remained essentially unsuccessful when, in 1948, the government enacted legislation unfavorable to non-Egyptian companies. This led some to suspend their search for oil in Egypt and others to close up their operations in the country.

The next dozen or so years saw the monarchy overthrown, the Suez Canal seized, and foreign petroleum production companies nationalized. Nevertheless, exploration for petroleum was resumed by some foreign interests and continued by Egypt's government and private companies. With discoveries of the Belayim fields in Sinai and offshore in the Gulf of Suez, exploration also became more successful.

In 1960, Egypt again sought to expand its oil industry by encouraging foreign oil investment. It offered new agreements for exploration and, by 1963, succeeded in negotiating contracts with several companies. Within a few years a number of new fields were found; of these, the most notable was El Morgan, the country's largest to date, discovered in 1965 by Standard Oil (Indiana). Then came the June 1967 Arab-Israeli war, in which Israel captured the Sinai Peninsula, including several of the onshore and offshore oil fields.

The El Morgan discovery had been fortuitous. Having gone on stream in April and although temporarily idled by the war, its rapidly increasing production did much to raise Egypt's total from about 120,000 b/d in the mid-1960s to over 325,000 b/d in 1970 (excluding the Sinai fields then under Israeli control). Recovery difficulties in El Morgan and other fields caused a sharp drop in 1972, however, and the Arab-Israeli war of October 1973 reduced output further, resulting in a decline to below 150,000 b/d for the year 1974. By 1976, when control of most of the occupied Sinai fields had been returned to Egypt, output had climbed back to the 1970 peak of over 325,000 b/d. By the end of 1979, with new development and the completion of the phased return of Sinai, production had almost doubled to about 600,000 b/d. It has continued rising since, averaging about 690,000 b/d in 1983.

Egypt's Suez Canal has played an important role for many years in the international oil trade. Until its closure following the 1967 war, the canal was a major artery for the shipment of oil from the Middle East to much of the world since it made a round-trip voyage from the Gulf terminals to Europe or North America about 9,500 miles shorter than the alternative route around Africa's Cape of Good Hope (see Figure 5). With the canal closed, the oil industry shifted most of its crude movements to the Cape route, using the then new tanker class of VLCCs, whose lower costs per barrel offset the greater distance oil had to be carried. When the canal was reopened on June 5, 1975, it was economically attractive only for smaller tankers and other vessels. This led the Egyptian government to undertake an expansion, completed in 1980, to enable larger vessels to transit the canal loaded and to permit VLCCs and even some ultra large crude carriers (ULCC's)* to transit the canal when returning in ballast to the Middle East.

Moreover, Egypt constructed the SUMED system of twin 42-inch crude oil pipelines, running from the northern Gulf of Suez to Alexandria, to provide an alternative route to the Mediterranean. In operation since early 1977, with an initial capacity of 800,000 b/d, it was doubled to its present 1.6 million b/d capacity in early 1978. SUMED enables oil to be moved by VLCCs from ports in the Arabian Gulf and Red Sea to the Gulf of Suez terminal at Ain Sukhna and to be carried to the Mediterranean terminal of Sidi Kerir. There the oil is picked up by other tankers for shipment to European and other refineries.

*greater than 320,000 dwt

3 Gas Operations

Until the 1970s, natural gas was a largely unused by-product of crude oil production in the Middle East. In 1972 gas production in the major countries of the region totalled 11.7 billion cubic feet per day (cf/d), or the equivalent of 1.95 million b/d of crude oil,* but only 30 percent was utilized (Table 4). The remaining 70 percent was flared because there was little local demand for it and the cost of transporting it to energy-importing countries was so high that it could not compete.

With rapidly rising energy prices and accelerated industrial development throughout the region since the early 1970s, however, the Middle East nations have been giving increasing attention to utilization of gas. By 1982, although gas production had fallen about 18 percent, utilization had increased 38 percent. Flaring had been reduced to about half. This trend is likely to continue. Some authorities believe flaring may drop to as low as 10 percent of gross production by 1990.

To assess the Middle East's gas production/utilization pattern, it is important to remember that natural gas is of two kinds: associated and non-associated. The first is so named because the gas occurs in reservoirs in association with crude oil, either in solution or as a gas cap overlying the crude. Such gas helps to drive oil to the surface and is recovered along with the oil. Thus, the production rate of associated gas tends to be proportional to the crude production rate. "Non-associated" gas is produced from reservoirs containing only gas; thus, its production can be controlled to meet demand. In the Middle East, associated gas comprises 53 percent of the gas reserves.

Table 4

Middle East Gas Production and Utilization

	1972			1982		
Country	*Gross Production Million cu.ft./day*	*Utilization Million cu.ft./day*	*% Utilized*	*Gross Production Million cu.ft./day*	*Utilization Million cu.ft./day*	*% Utilized*
Abu Dhabi	1,085	121	11	1,080	730	68
Iran	4,024	1,724	43	2,370	990	42
Iraq	718	90	13	410	70	17
Kuwait	1,774	688	39	450	400	89
Qatar	493	107	22	560	510	91
Saudi Arabia	3,150	533	17	3,250	1,310	40
Other*	500	300	60	1,500	900	60
Total	11,744	3,563	30	9,620	4,910	51

**Includes Bahrain, Egypt, Oman and United Arab Emirates (excluding Abu Dhabi).*

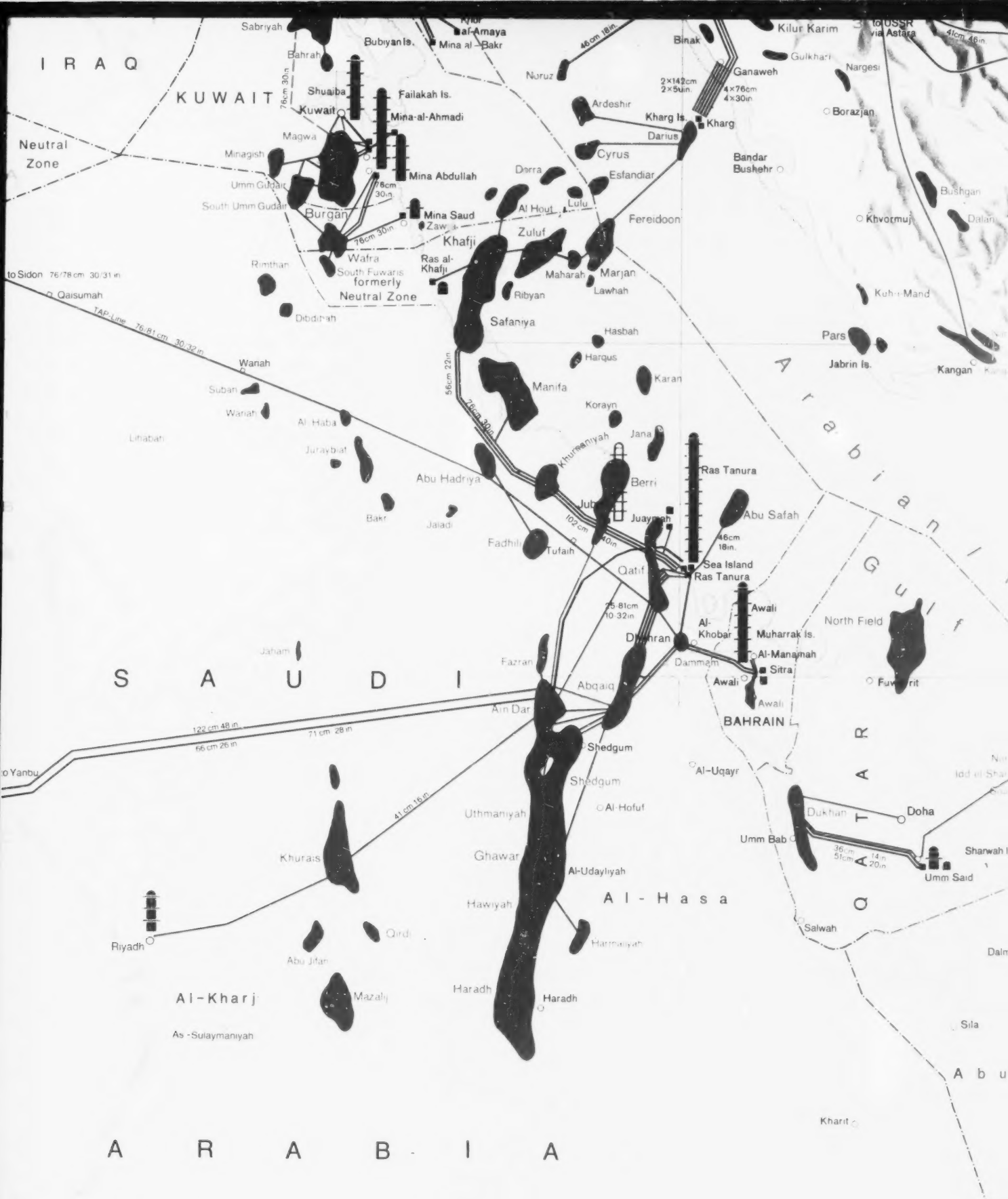
Sources: Cited countries, Statistical Bulletin, *Organization of the Petroleum Exporting Countries; estimates for "other" countries, Exxon Corporation.*

Although reserve levels are comparable, production rates of the two types of gas are widely different and vary among countries of the region. In 1972, non-associated gas production was well under 5 percent of the region's total gas production. This was because most countries of the region had surplus associated gas. By 1982, non-associated gas accounted for 15 percent of the output and, given the impetus of the Middle East's industrial development, the non-associated share of the region's total gas production is continuing to grow.

As production of associated gas has grown with crude production, its producers have stepped up investments in plants that remove liquid hydrocarbons from the gas to make natural gas liquids (NGL), such as liquefied petroleum gas (LPG)—butane and propane—and natural gasoline.

**6,000 cubic feet of gas contain the energy equivalent of approximately 1 barrel of oil. At this conversion rate, the Middle East's proved gas reserves are equivalent to about 35 percent of its oil reserves.*

Text continues on page 22



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0 25 50 75 km

0 25 50 Mi

Shiraz
Saidabad (Sirjan)
Bam
Sarvistan
Firuzabad
I R A N
Aghar
Jahrom
Bandubast
Alamarvdasht
Varavi
Namaki
Sirkhun
Bandar Abbas
Minab
Eshkanan
Gashu
Suru
Bandar Maqam
Shoeyb Is.
Lavan
Hendorabi Is.
Qeys Is.
Bandar Lengeh
Salakh
Gavarzin
Qeshm Is.
Strait of Hormuz
Henjam
Great Tunb Is.
Forur Is.
Little Tunb Is.
Saleh
Bani Forur Is.
Oman
Ras al-Khaima
Jask
Sirri Is.
Abu Musa Is.
Mubarak
West Structure
Rakhsh
Rostam
Sassan
Umm al-Qaiwain
Ajman
Sharjah
Dubai
Fujairah
Halul Is.
Maydam Mahsam
Abu al-Bukhoosh
Nasr
Bu Hanine
W. Fateh
Fateh
SW Fateh
Delta
Rashid
Sir Abu Nuayr Is.
Das Is.
Umm Shaif
Mandous
Zakum
Al-Bunduq
Satah
Arzanah
Sathar
Raazboot
Umm Addalkh
Jarnain
Ghasha
Dalmah
Mubarraz
Abu Dhabi
Jarn Yaphour
Sir Bani Yas Is.
Marawah Is.
Zubbaya
Jebel Dhannah
Ruwais
Al-Abyadh Is.
Rumaitha
Shames
Bab
Habshan
Bu Hasa
Huweila
Sabil
Asab
Shah
U A E
Undemarcated
Zarara
Kidan North
Shuwaihat
Ramlah
Suhul
Kidan South
Sohar
Buraymi
Al Ayn
Ibri
Mina al-Fahal
Nahr
Fahud
Yibal
O M A N
Gulf of Oman

Text continues from page 19

Under the impetus of accelerating oil prices, the region's NGL capacity has grown in little more than 10 years from two small plants in Kuwait and Saudi Arabia to facilities in seven countries with a total capacity of over 1.2 million b/d (Table 5). Essentially all of the LPG output is exported in specialized refrigerated vessels, most of it to Japan, where LPG's clean-burning properties make it a desirable, though premium-priced, fuel. Led by new projects in Iran and Iraq, the region's NGL capacity is expected to rise one-third by 1990.

Table 5

Middle East Natural Gas Liquids (NGL) Capacity

As of January 1, 1984

Country	*Thousands of Barrels per Day*
Saudi Arabia	675
Kuwait	200
Abu Dhabi (UAE)	190
Iran	60
Qatar	55
Dubai (UAE)	20
Bahrain	10
Iraq	*
Total	1,210

**Two major plants are completed but not in operation.*
Source: Exxon Corporation estimates.

Saudi Arabia

Saudi Arabia has been the region's leading producer of gas, as of crude oil. Large-scale utilization of this gas began with the advent of industrialization in the early 1970s and was subsequently reinforced by a $14 billion master gas system and the development of an NGL industry. On completion, the gas system will gather and process more than 99 percent of the kingdom's associated gas production. In fact, the future demand for gas is expected to be so large—for petrochemicals, steel, sulfur and other new industries—that non-associated gas reserves are being developed as well.

Iran

With gas reserves of 480 trillion cubic feet (tcf), Iran has nearly two-thirds of the region's total, but it currently accounts for only one-fifth of the area's gas utilization. In 1970, Iran began the operation of a 1.6 billion cf/d pipeline (IGAT-1) to supply treated associated gas to both northern Iran and the Soviet Union. By 1978, plans were well advanced for a similar, but much larger, parallel line (IGAT-2), and construction began that year on the southern half. Work was halted in 1979, however, following the revolution. Plans also had been developed by 1978 for supplying 10 billion cf/d of non-associated gas to the new pipeline, to gas injection projects that would enhance recovery from producing oil fields, and to a proposed liquefied natural gas (LNG) plant. But, non-associated gas development was severely curtailed—first in the wake of the Iranian revolution, then again when the war with Iraq broke out. At the same time, production of associated gas has fallen with the decline in crude output. No gas deliveries have been made to Russia since 1980. Given Iran's enormous reserves, the potential for extensive gas-based industrialization and large gas export projects remains.

Kuwait

Significant amounts of associated gas have been utilized in Kuwait for more than 10 years. Major applications have included processing into NGL, power generation, fertilizer manufacture, and refinery fuel. These and other gas-based facilities and the related supply system were designed on the basis that up to 1.5 billion cf/d of associated gas would be available from crude production of about 3 million b/d. Significant gas shortages were felt in the early 1980s, however, when gas output fell to 400 million cf/d as crude production dropped below 1 million b/d. At the start of 1984, the country had no known reserves of non-associated gas, but was actively conducting an exploration program.

Qatar

Owing largely to the discovery of the offshore North field in 1972, Qatar's gas reserves have jumped from less than 5 tcf to more than 60 tcf. Statements by QGPC, the national oil company, indicate that the actual reserve is likely to be substantially more than 100 tcf. Between 1978 and 1981 Qatar developed fertilizer, steel, power, petrochemical and NGL production, all based on associated gas and backed up by very limited onshore non-associated gas reserves. As the mag-

nitude of the North field became evident, Qatar began planning its development to supplement the existing gas system and to supply an LNG plant having at least 1 billion cf/d export capacity. In 1984 QGPC announced an agreement with BP and CFP for their participation in the LNG venture, with the project completion to occur some time in the 1990s. Qatar's total gas reserves are adequate to support several world-scale LNG plants. Their realization, however, depends on market conditions.

Iraq

Iraq has the lowest rate of utilization of gas reserves among the major Middle East oil producers. Prior to the war with Iran, Iraq's gas-based industrialization consisted of power generation, a fertilizer plant, an iron and steel mill, and an aluminum plant. Plans for a petrochemical plant and NGL recovery facilities were well underway in 1980 when the war began. Although these plants have since been completed, startup is not expected until after the war. As a result, Iraq continues to flare over 80 percent of its associated gas production. Iraq is expected to concentrate on increasing gas utilization when the war is over.

United Arab Emirates

The United Arab Emirates possess substantial gas reserves, currently estimated at 31 tcf and mostly located in Abu Dhabi. In 1976, the Abu Dhabi government, having acquired a 60 percent interest in the industry's oil operations, nationalized all non-associated and associated gas within its boundaries and, shortly thereafter, began tapping its gas reserves. In the mid-1970s, Abu Dhabi Gas Liquefaction Company Limited (ADGAS) constructed the region's only LNG plant. With a capacity of 2.2 million tons per year (equivalent in energy to 55,000 b/d of oil), the Das Island plant began production and export to markets in Japan in 1977.

Abu Dhabi and some of the other sheikhdoms also have NGL projects in operation or under way. GASCO, a consortium of companies headed by ADNOC, the national oil company, operates a plant at Ruwais with a capacity of 150,000 b/d of NGL. Sharjah and Ras Al Khaimah recently placed plants onstream, and another is scheduled to start up in 1984 in Dubai.

4 The Changing Relationships With Producing Countries

Since the early decades of the century, changes have occurred in the relationships between oil-producing countries and the international oil companies. Changes, with their consequences for consumers, are still going on.

The Early Years. The original Middle East oil exploration and production concession agreements which U.S. companies signed were entered into during the late 1920s and 1930s. During this period the average wellhead value of U.S. crude oil, with which Middle East oil would have to compete in European markets, was falling. (From a high of $3.07 per barrel in 1920, when post-World War I inflation peaked, it fell to $1.34, recovered to $1.88 in 1926, and then slumped well below $1 during the early 1930s as the Great Depression cut demand and major new U.S. discoveries added to supplies.) Despite the combination of depressed prices and unknown eventual costs of finding and producing new oil in difficult areas far removed from major markets, the Middle East concession agreements provided that the companies would pay the governments land rents plus fixed amounts for each barrel of oil produced —irrespective of the profitability of a venture.

Fifty-fifty. In the early 1950s, as market prices for oil were strengthening and relatively low producing costs were made possible by high production rates and technical innovations in the Middle East, income taxes were introduced, at a 50 percent rate, in most of the region's producing countries. Thereafter, the companies and the host governments shared profits fifty-fifty. To determine taxable income, the companies were permitted to deduct a "marketing allowance" off their posted prices for crude oil.* This allowance was intended to encourage a rapid growth in Middle East production by compensating the companies for the extra costs which they incurred in marketing the area's crude.

**In the Middle East and other regions outside the United States and Canada, posted prices traditionally were set and publicly stated by oil companies as the "list" prices at which they would sell crude oil. With the introduction of income taxes, posted prices less allowances also became "tax reference prices" on which payments to governments were based. In 1971, the companies agreed to share the determination of posted prices with governments and, in 1973, governments took complete control of setting postings, as noted on page 27. (In the U.S. and Canada, posted prices were, and remain, the prices at which companies buy crude.)*

As production costs per barrel of oil declined with greater output and as the companies occasionally posted small increases in oil prices, government revenue per barrel rose. With the industry continuing to make major discoveries, however, production capacity was being developed more rapidly than oil demand by the late 1950s. The ensuing competition for market outlets resulted by 1957 in the oil companies' widespread discounting from posted prices and, in 1959 and 1960, in the reduction of posted prices themselves. These actions led to a fall in the Middle East producing countries' revenue per barrel—from a high of 86 cents in 1957 to 78 cents in 1960—and provided a key impetus to the formation of OPEC in the latter year.

The Birth of OPEC. In September 1960, government officials of Saudi Arabia, Venezuela, Iran, Iraq and Kuwait, meeting in Baghdad, adopted two principal resolutions. The first stated that the five countries could "no longer be indifferent to the attitude adopted by the oil companies in effecting (posted) price modifications". The resolution demanded that the oil companies "maintain their prices steady and free from all unnecessary fluctuations" and declared the countries' intention to "study and formulate a system to ensure the stabilization of prices by, among other means, the regulation of production..."

The second resolution advised that the "Conference decides to form a permanent organization called the Organization of the Petroleum Exporting Countries...The principal aim of the organization shall be the unification of petroleum policies for the member countries and the determination of the best means for safeguarding the interests of member countries, individually and collectively."

With approval of the resolutions later that year by each of the governments, OPEC officially came into being. In little more than 10 years, OPEC expanded its membership to its present 13, of which six are Middle Eastern states. (Qatar joined in 1961, Indonesia and Libya in 1962, Abu Dhabi—later the UAE—in 1967, Algeria in 1969, Nigeria in 1971, and Ecuador in 1973. Gabon became an associate member in 1973 and a full member in 1975.)

Maintaining Government Take. In its early days, OPEC's principal objective was to insulate its members' revenue per barrel (then referred to as government "take") from a decline in crude oil market prices, which continued throughout the 1960s. Member governments achieved this in essentially two ways: by exerting pressure to keep stable the companies' posted prices for crude oil, on which their income tax collections were based, and by changing the manner in which the tax revenues per barrel produced were calculated.

By treating royalty payments* as an item of expense, rather than as a tax credit, the income tax payments due the governments were increased several cents a barrel. In addition, the companies' marketing allowances off posted prices were reduced. As a result of these changes and the continued decline in the companies' operating costs, average government take to Middle East countries recovered during the decade of the 1960s, rising from 78 cents per barrel in 1960 to about 85 cents in 1968.

By 1970, market conditions had changed significantly as the world's demand for oil accelerated. Whereas oil had accounted for about 10 percent of the total energy consumed in Western Europe in 1950, its share was more than 55 percent by 1970. In Japan over the same period, oil's share rose from 9 percent to 33 percent. Imports accounted for virtually all the oil consumed in both areas. Even in the U.S., which already had relied on petroleum for 40 percent of its energy consumption in 1950, oil's share rose further, to 44 percent; almost a third of the increase in petroleum product demand was supplied by imports.

The world had become not only heavily dependent on oil, but, more specifically, on imported OPEC oil. And of OPEC's production, 60 percent came from its Middle East members (see Table 6). OPEC's domination of the oil export market, and its commanding position with regard to oil reserves, provided it the necessary basis for a new period of assertiveness.

**In the Middle East, royalty payments—usually at a rate of 12.5 percent—were made to the governments on the posted price value of oil produced.*

In 1970, a Syrian bulldozer ruptured and shut down temporarily the Trans-Arabian Pipeline which brought crude oil from the east coast of Saudi Arabia to the Mediterranean. With the Suez Canal closed following the 1967 Arab-Israeli war, the closure of Tapline meant that Gulf oil destined for Europe had to be brought around the Cape of Good Hope. Demands on the world's tanker fleet increased, and Europe became more dependent on oil from North Africa. Libya seized this opportunity to press for higher posted prices and a higher income tax rate, and reinforced its bargaining power by imposing production restrictions on several of the oil companies producing there. Occidental Petroleum Corporation, which relied on Libya for over 95 percent of its crude supply, felt compelled to agree to higher posted prices in September 1970 after Libya had not only cut back production, but also threatened a total production stoppage.

At the OPEC conference in Caracas in December 1970, other exporting states sought to follow the Libyan example. They proposed that posted price increases be extended to all OPEC members; that 55 percent be established as the minimum tax rate on the net income of oil companies operating in member countries; and that nominal posted prices be linked to an index of industrial countries' export prices to protect the purchasing power of oil revenue against industrialized countries' inflation and currency devaluations.

Table 6

OPEC Crude Oil Production
1960-83

(Thousands of Barrels per Day)

	Middle East Members	*% of OPEC*	*Other Members*	*Total OPEC*	*OPEC as % of Non-Communist World*	*Middle East OPEC Members as % of Non-Communist World*
1960	5,028	64	2,846	7,874	44	28
1961	5,577	66	2,920	8,497	45	30
1962	6,110	61	3,844	9,954	49	30
1963	6,701	62	4,164	10,865	50	31
1964	7,358	61	4,724	12,082	52	32
1965	7,996	61	5,181	13,177	53	32
1966	8,876	62	5,341	14,217	53	33
1967	9,837	63	5,794	15,631	54	34
1968	10,855	61	6,805	17,660	55	34
1969	11,893	58	8,448	20,341	59	34
1970	13,229	60	8,905	22,134	58	35
1971	15,594	62	9,498	25,092	63	39
1972	17,301	65	9,410	26,711	64	41
1973	20,599	66	10,390	30,989	67	45
1974	21,234	69	9,513	30,747	68	47
1975	18,904	70	8,296	27,200	65	45
1976	21,309	70	9,249	30,558	67	47
1977	21,805	69	9,612	31,417	67	47
1978	21,013	69	9,358	30,371	64	45
1979	21,016	68	9,895	30,911	64	43
1980	17,913	67	9,028	26,941	59	40
1981	15,221	67	7,459	22,680	55	37
1982	12,137	64	6,754	18,891	49	31
1983	10,965	62	6,584	17,549	46	29

Sources: U.S. Energy Information Administration, International Energy Statistical Review, *U.S. Central Intelligence Agency*

Higher Government Take. Responding to pressures from producing country governments, 24 oil firms commenced in early 1971 negotiations with the Gulf members of OPEC in Teheran in an effort to agree to a new price structure for the Gulf. After an initial stalemate, an agreement was concluded in February 1971 which included a 30 cent increase in posted (or tax reference) prices, a 55 percent income tax rate, and the elimination of special allowances on sales of crude oil. In all, the Teheran agreement resulted in an increase of up to 50 percent–25 to 65 cents–in per barrel payments to the producing countries; it also provided for an escalation in posted prices of 50 cents per barrel over the following five years–the intended term of the agreement.

Negotiations in Tripoli, Libya, six weeks later led to similar arrangements for Libyan oil. The Tripoli agreement, signed by the Libyan government and 15 oil companies, was also intended to last five years. Comparable agreements with Iraq and Nigeria followed in the ensuing weeks.

Thus, posted prices, previously set by the companies as their asking prices for oil, came to be governed by a contract between the companies and the governments.

The Teheran and Tripoli agreements were a watershed in the international oil industry, marking the first time that the producing country governments of the Middle East had achieved the dominant role in the setting of crude oil prices. While posted prices had long ceased to be synonymous with the companies' selling prices, postings affected market prices as they determined the companies' tax and royalty costs. The key to the exporting countries' success was their readiness to deny oil to any producing company not meeting their minimum terms.

Government Participation. Buoyed by its pricing successes, OPEC in September 1971 raised a new issue: it directed its members to "establish negotiations with the oil companies, either individually or in groups, with a view to achieving effective participation...in the operations of the industry within the producing countries".

In December 1971, Libya nationalized BP's 50 percent interest in the Sarir field in retaliation for the British government's purported role in permitting Iran to occupy three Arab islands in the Gulf. Further nationalizations followed in Libya and Iraq.

At about the same time, four Gulf producing states undertook participation negotiations with the oil companies. After lengthy negotiations, a General Agreement on Participation was reached in December 1972 with representatives of the governments of Saudi Arabia, Kuwait, Abu Dhabi and Qatar. Its provisions included the acquisition by the governments of an immediate 25 percent participation interest in the existing oil concessions with increasing government shares each year thereafter, leading to 51 percent government participation by 1982. The companies were to be compensated for unrecovered investments, "with due allowance for inflation that has occurred since the investments were made". Although the Kuwait National Assembly rejected the agreement, the governments of Saudi Arabia, Abu Dhabi and Qatar ratified it.

The 1972 participation agreements, however, were short-lived. As world oil markets tightened, the OPEC countries were quick to take advantage of their growing bargaining strength vis-a-vis the oil companies. They called the 25 percent participation unsatisfactory and raised their demands. Kuwait resumed negotiations for a larger ownership share and, in mid-1974, obtained 60 percent, retroactive to the previous January. Later that year, the other countries joined Kuwait in achieving 60 percent. Eventually, as we will see, most were to reach 100 percent.

5 A New Oil Pricing Environment

By the fall of 1973, the Gulf members of OPEC had become dissatisfied with the 1971 Teheran price and tax agreement. Scheduled to be in force through 1975, it had already been modified twice: by the Geneva agreements of January 1972 and June 1973, which raised the posted price of oil by 20 and 15 cents per barrel, respectively, to reflect changes in currency exchange rates and inflation. (The U.S. dollar, in which OPEC crude prices were, and still are, quoted, was devalued in February 1973.) But the countries regarded these gains as inadequate.

In September 1973, the oil ministers of OPEC's Gulf member countries scheduled a meeting with the companies for October 8 to negotiate additional adjustments of the Teheran tax reference price provisions, again with the expressed goal of offsetting their loss of purchasing power. Two days before the meeting began, the Arab-Israeli war broke out, resulting in some disruption in oil movements and uncertainties about future consequences for oil markets. A week of talks failed to produce an agreement, and on October 12 the sessions were recessed.

Unilateral Action. Before negotiations were rescheduled, the OPEC countries acted unilaterally: on October 16, 1973 they decreed an increase in the posted price of the marker crude, Arabian Light, from $3.01 to $5.12 per barrel and announced a selling price for the governments' share of crude of $3.65 (Table 7). The increase in posted prices of about 70 percent resulted in a corresponding increase, or about $1.43 per barrel, in payments to governments. The companies' profit margins per barrel, on the other hand, were squeezed as they were unable to pass on to their customers all of their additional cost of crude. (As a consequence of the unilateral posting of tax reference prices by the OPEC member governments, the companies withdrew their own postings for crude.)

The day after the increases in posted and selling prices, the Organization of Arab Petroleum Exporting Countries (OAPEC)* announced a cutback in production, and OAPEC members subsequently embargoed oil shipments to the United States and the Netherlands for actions or policies supportive of Israel in the Arab-Israeli war.

*Formed in January 1968, OAPEC now has nine member states.

Table 7

Changes in Selling Price of Arabian Light Crude Oil

Prices shown here are those for Arabian Light crude, regarded since February 1971 as the bench mark for other Saudi Arabian and OPEC crude grades. They are FOB prices quoted at Ras Tanura.

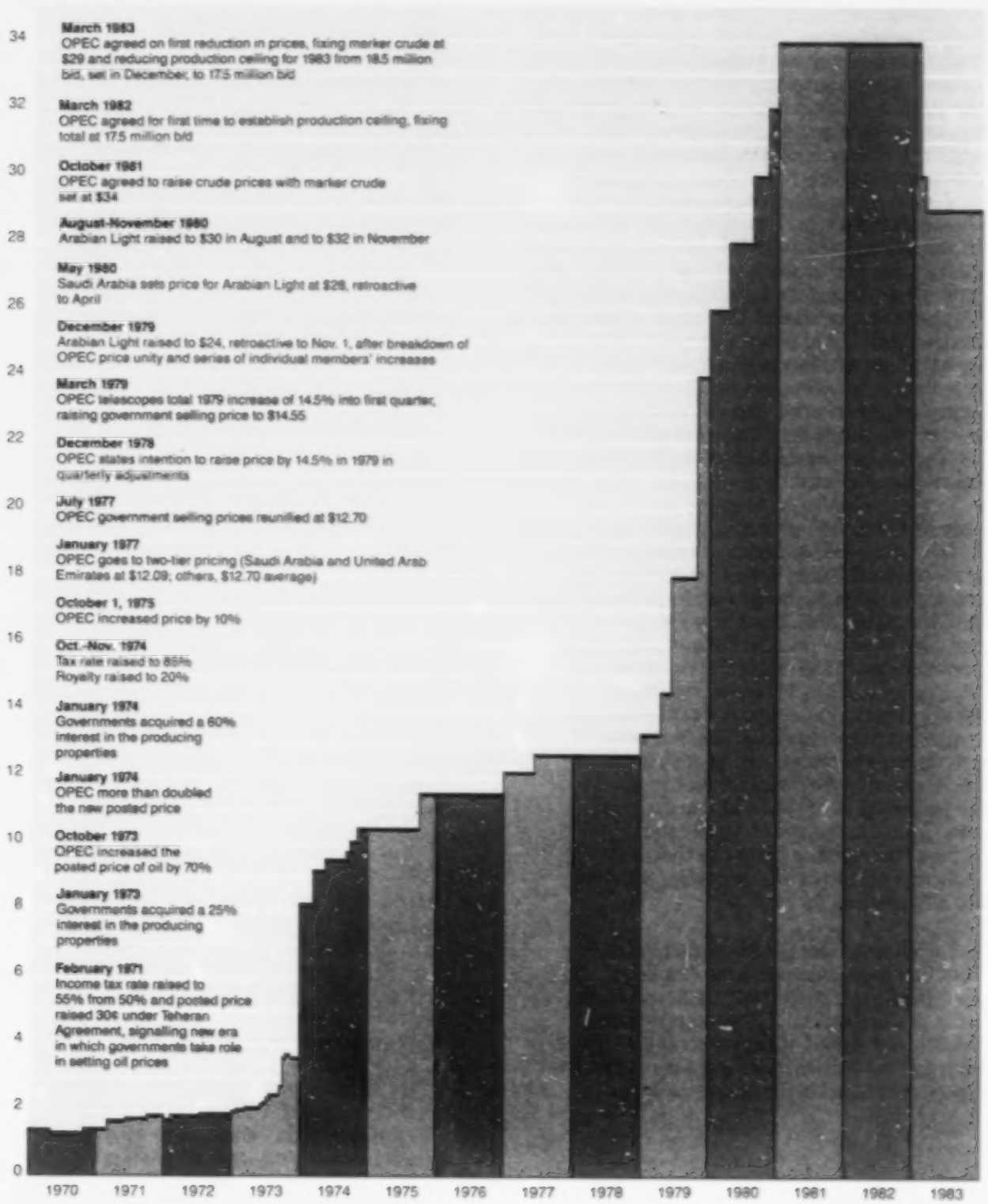
Date	*Dollars per Barrel*	*% Change*
1/1/70	1.39	–
6/1/70	1.34	(3.6)
11/30/70	1.41	5.2
2/15/71	1.68	19.2
6/1/71	1.74	3.6
10/1/71	1.79	2.9
1/1/72	1.75	(2.2)
1/20/72	1.87	6.9
7/17/72	1.91	2.1
1/1/73	2.00	4.7
1/10/73	2.10	5.0
4/1/73	2.19	4.3
6/1/73	2.29	4.6
7/1/73	2.33	1.8
7/6/73	2.48	6.4
8/1/73	2.55	2.8
10/4/73	2.70	5.9
10/16/73	3.65	35.2
11/1/73	3.70	1.4
12/1/73	3.60	(2.7)
1/1/74	8.32	131.1
3/1/74	9.30	11.8
5/17/74	9.60	3.2
9/19/74	9.80	2.1
10/3/74	10.15	3.6
11/1/74	10.46	3.1
10/1/75	11.51	10.0
1/1/77	12.09*	5.0
7/1/77	12.70	5.1
1/1/79	13.34	5.0
4/1/79	14.55**	9.1
6/1/79	18.00	23.7
11/1/79	24.00	33.3
1/1/80	26.00	8.3
4/1/80	28.00	7.7
8/1/80	30.00	7.1
11/1/80	32.00	6.7
10/1/81	34.00	6.3
2/1/83	30.00	(11.8)
3/1/83	29.00	(3.3)

*Two-tier pricing came into effect, lasting until next price change.

**From the spring of 1979 until October 1981 OPEC did not have a unified pricing system.

Figure 6

Major Events Which Changed Middle East Crude Oil* Selling Prices—1970-83


DOLLARS PER BARREL
34
32
30
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
March 1983
OPEC agreed on first reduction in prices, fixing marker crude at $29 and reducing production ceiling for 1983 from 18.5 million bid, set in December, to 17.5 million bid
March 1982
OPEC agreed for first time to establish production ceiling, fixing total at 17.5 million b/d
October 1981
OPEC agreed to raise crude prices with marker crude set at $34
August-November 1980
Arabian Light raised to $30 in August and to $32 in November
May 1980
Saudi Arabia sets price for Arabian Light at $28, retroactive to April
December 1979
Arabian Light raised to $24, retroactive to Nov. 1, after breakdown of OPEC price unity and series of individual members' increases
March 1979
OPEC telescopes total 1979 increase of 14.5% into first quarter, raising government selling price to $14.55
December 1978
OPEC states intention to raise price by 14.5% in 1979 in quarterly adjustments
July 1977
OPEC government selling prices reunified at $12.70
January 1977
OPEC goes to two-tier pricing (Saudi Arabia and United Arab Emirates at $12.09; others, $12.70 average)
October 1, 1975
OPEC increased price by 10%
Oct.-Nov. 1974
Tax rate raised to 85%
Royalty raised to 20%
January 1974
Governments acquired a 60% interest in the producing properties
January 1974
OPEC more than doubled the new posted price
October 1973
OPEC increased the posted price of oil by 70%
January 1973
Governments acquired a 25% interest in the producing properties
February 1971
Income tax rate raised to 55% from 50% and posted price raised 30¢ under Teheran Agreement, signalling new era in which governments take role in setting oil prices
1970
1971
1972
1973
1974
1975
1976
1977
1978
1979
1980
1981
1982
1983

*Using Arabian Light, the marker crude, as an example

In the consequent environment of tight supplies, OPEC again raised tax reference prices, effective January 1, 1974. The newly posted price for the Arabian Light marker crude was $11.65—over three times what it had been just three months earlier.

By the end of 1975, the per barrel income of Middle East oil producing country governments had been raised to about $11, compared with about $2 per barrel in early 1973 (see Figure 10). This was due not only to the increases by these governments in posted prices, but also to concurrent increases by them in the rates at which income taxes and royalties were imposed on the oil companies. Levied at 55 percent since 1971's Teheran agreement, the income tax rate was increased in steps to 85 percent of taxable income by November 1974; royalties were raised from 12.5 percent to 20 percent of the posted price.

When governments acquired and increased equity ownership in their countries' oil production in 1974, their posted prices lost importance as the prices at which oil was sold. By November, selling prices, which had been essentially those of the companies, became government selling prices—the prices at which Middle East governments would sell crude to the companies and to other, third party customers.

The 1973-74 oil price escalation interrupted the growth in world-wide petroleum consumption, as oil users sought to minimize the impact of higher prices through conservation and efficiency measures and through substitution for petroleum. Middle East production managed only a slight gain in 1974 and, for the first time in thirty years, declined in 1975 (Figure 7).

Two-Tier Pricing. During 1976, as an excess of available crude oil overhung the world market despite recovery in demand, OPEC members kept their selling prices steady—until year-end. At a December 1976 meeting, several countries, led by Iran, pressed for a substantial increase. Saudi Arabia, on the other hand, argued for moderation. When the two camps failed to reach agreement, a two-tier pricing system emerged. Saudi Arabia and the UAE raised their government selling prices about 5 percent, effective January 1, 1977. The other 11 OPEC members raised theirs about 10 percent and scheduled an additional 5 percent increase for July 1977. Saudi Arabia reacted by suspending its production allowable of 8.5 million b/d and letting its crude production rise.

In July, the two-tier system was ended in a compromise. Saudi Arabia and the UAE raised their prices 5 percent while the others agreed to forego their additional scheduled increase, thus bringing their selling prices into alignment at $12.70 per barrel for Arabian Light marker crude. Petroleum demand continued to rise, and Middle East production reached a peak daily average of 22.5 million for the year as a whole.

Iran in Crisis. The $12.70 price was still in effect in the latter half of 1978, when political problems erupted in Iran. In September, martial law was declared in the major cities. Strikes occurred in the oil fields and refineries, disrupting production and exports, and forcing BP and Shell to declare first a limited and then a full *force majeure* on crude oil deliveries. Other companies followed. In November and December, Iranian production fell dramatically, and uncertainty about future security of supplies gripped world consumers. Although world oil demand continued to climb, Middle East production slipped.

This was the context in which the annual year-end OPEC conference agreed to raise the government selling price of the marker crude quarterly during 1979; by the fourth quarter, the price would be $14.55, 14.5 percent higher than it had been at the start of the year. Events in Iran quickly wrecked that plan, however. As 1978 ended and the crisis became more violent, most expatriate employees in the oil sector left the country. In the midst of the government changes, demonstrations and strikes, Iranian exports plummeted until they were finally suspended altogether on December 26. Crude oil prices soared on the spot market.

A "Cushion" for Consumers. Consuming countries, which before the crisis had been importing about 85 percent of Iran's production of 5.5 million b/d, were "cushioned" somewhat from the loss of Iranian crude by increased exports from other countries, notably Saudi Arabia. In January 1979, the Saudi government temporarily raised its production allowable to 9.5 million b/d, 1 million b/d above its official ceiling.

On March 5, 1979, the new revolutionary government in Iran resumed exports, although at a level substantially below the prerevolutionary one. Nonetheless buyers continued vigorous bidding for supplies to meet demand and to restore the very low world inventory levels as a precaution against further supply disruptions.

OPEC members decided that their planned quarterly selling price increases for 1979 would not adequately reflect these changed circumstances. In March, they telescoped these adjustments, raising the marker crude price to $14.55, the level it had been scheduled to reach on October 1.

The Second "Price Shock." In earlier times, the marker price would have served as the benchmark for all other major types of crude oil. However, crude transactions in the spot market were exacting premia of $10 and more per barrel, as some OPEC members chose to charge what the market would bear. The result was another breakdown of OPEC's unified pricing system. In July, responding to increasing demand and to higher prices prevailing elsewhere, Saudi Arabia raised the price of Arabian Light to $18, retroactive to June 1. This Saudi effort failed to narrow the price gap within OPEC as other governments raised the premia on their crudes.

With world demand continuing strong—as things turned out, 1979 was the peak year (Figure 8)—the Saudis again raised the marker crude price in December, to $24 per barrel retroactive to November 1, and, in January 1980, to $26 per barrel retroactive to January 1. These efforts still failed to reunify OPEC prices; other major OPEC exporters continued to raise their prices to maintain the differential.

In June 1980, the OPEC governments' oil ministers decided "to set the level of oil price for a marker crude up to a ceiling of $32 per barrel," but made allowances for the price of certain higher quality grades to go to $37. Saudi Arabia, however, maintained a price of $28 a barrel until September, when it raised the price of Arabian Light to $30, retroactive to August. In November, it raised the price to $32 per barrel, but early in 1981 some other OPEC producers raised prices and delayed price unification again.

Toward Complete Ownership. While world attention was focused on OPEC governments' escalation of their selling prices for oil, other changes were occurring in government-company relationships which strengthened the countries' ability to influence world oil markets. Most OPEC governments were raising their ownership of producing operations to 100 percent and turning their interests over to national oil companies. In the Middle East, the international oil companies' share in the ownership of total production had dropped below 10 percent by 1980 (Figure 9).

As the 1980s unfolded, the various national oil companies were expanding their refining operations and increasing sales of petroleum products in export markets (see next chapter). They continued to rely on foreign personnel and expertise, however, for much of their operations. Thus, while the private companies—including many of the original concession holders—had lost most of their equity and become primarily purchasers of the Middle East's exported crude oil, they continued to supply personnel and technical and management services to the government companies.

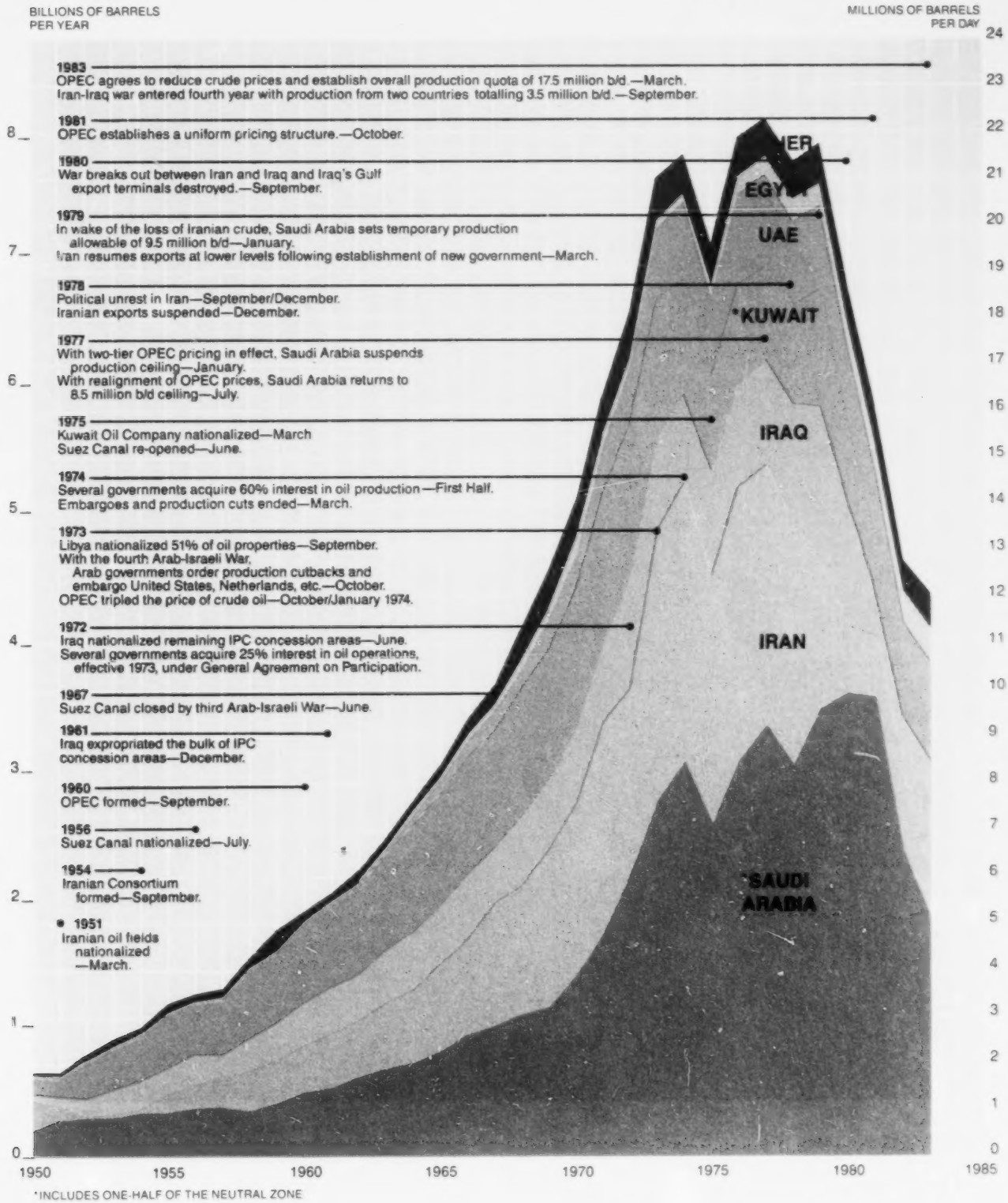
Uniform Pricing. It was not until October 1981 that OPEC members again unified their price structure—around a marker crude price of $34 per barrel. As a result, the selling price of Arabian Light was increased another $2 per barrel while the benchmark used by the other 12 countries for their crudes was cut $2. These actions resulted in about an average $1 per barrel increase in the worldwide price of crude.

Thus, in a series of almost quarterly increases from the beginning of 1979 until the fall of 1981, the price of OPEC's marker crude had gone up more than 150 percent. While these increases temporarily brought the OPEC governments sharply increased per barrel revenues, they also depressed world oil consumption by contributing to reduced economic growth and by encouraging conservation and a shift to oil substitutes. Moreover, they stimulated greater development of oil resources in non-OPEC countries at the expense of OPEC oil. As a result, the total oil revenues of Middle East governments began to drop in 1981 (Figure 10).

Price Softening. With demand softening for oil in general—and for OPEC oil in particular—surplus capacity built up. It exerted downward pressure on market prices and caused financial strains in several OPEC states, notably those with large populations and a high need for imported products (sometimes referred to as the high absorber countries). In March 1982 OPEC members, in an effort to sustain prices, established a total OPEC production ceiling of 17.5 million b/d, compared with 1981 output of 22.7 million b/d, as well as production quotas for individual member countries.

Figure 7

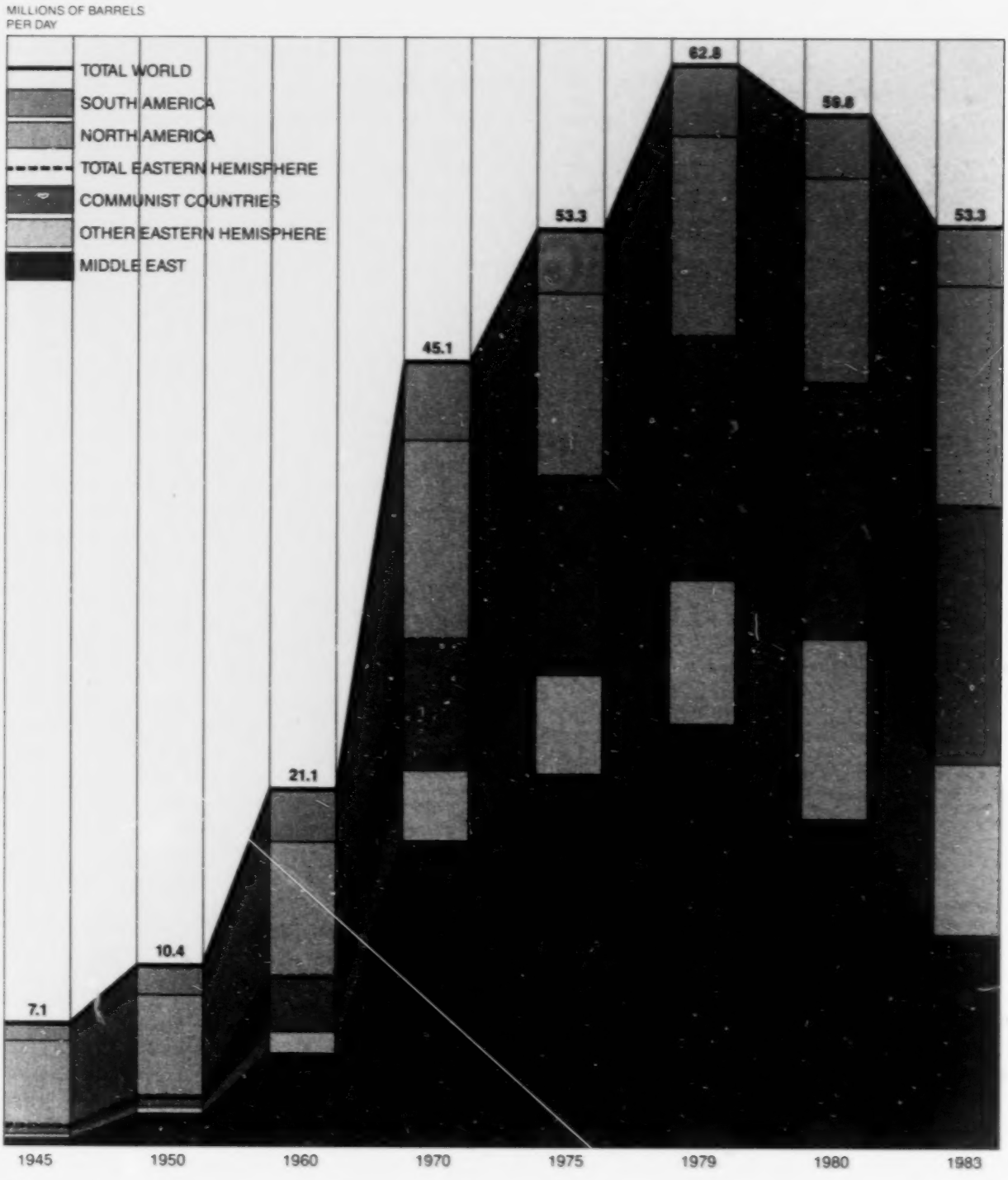
Middle East Crude Oil Production and Significant Related Events—1950-83



*INCLUDES ONE-HALF OF THE NEUTRAL ZONE

Figure 8

World Crude Oil Production—1945-83



Source: Oil & Gas Journal

As 1982 progressed, demand for OPEC oil remained depressed, and world crude market prices continued to soften. In an effort to raise more revenues, some members produced above their quotas and sold at discounts off official government selling prices. This resulted in total OPEC production of more than 1 million b/d in excess of the official ceiling. In December of the year, OPEC sought to formalize the new production level by increasing the quota to 18.5 million b/d for 1983. This accomplished little, however, in the face of stagnant world demand and the inability of OPEC members to agree on lower prices.

Having come through a year in which total OPEC production had dropped to the lowest share of total free world output in 20 years (Table 6)—members held a special meeting in late January 1983 to deal with the situation. Against a background of continuing decline in production, the meeting ended without agreement. Following intensive bilateral negotiations and extensive consultations in February among the members of the Gulf Cooperation Council,* OPEC ministers met again in early March.

After two weeks of discussions, they agreed to reduce the selling price for the marker crude by $5 to $29 a barrel, effective March 1**—the first official price cut in OPEC's 22½ year history. They also agreed to establish new individual quotas within a lower total OPEC production ceiling of 17.5 million b/d for the rest of 1983. Saudi Arabia was not assigned an individual quota, but accepted the role of "swing" producer with an implied production level in the neighborhood of 5 million b/d.

The plan held up through 1983. For all of that year, OPEC produced around 17.6 million b/d. Of this, Saudi Arabia accounted for about 5.1 million b/d and all other Middle East members combined, around 5.9 million b/d.

Formed in 1981 by six Gulf states for the coordination of their economic and other policies, the council consists of four OPEC members—Kuwait, Qatar, Saudi Arabia and United Arab Emirates—plus Bahrain and Oman.

**Some OPEC members implemented the decision in two steps, reducing the prices of their oil by $4, effective February 1, and an additional $1, effective March 1.*

6 Refining and Other Industrial Activities

While dwarfed by crude oil producing and exporting operations, petroleum refining and petrochemicals are by now substantial industries in the Middle East. Despite excess worldwide capacity in these businesses, construction of both types of facilities is continuing throughout the region. In fact, the pursuit of downstream development (including natural gas processing) has become a top government priority for several of the oil-producing countries.

Although projections, made several years ago, of total Middle East refining capacity of about 6 million b/d by 1984 did not materialize, the current level of about 3.6 million b/d does represent a 44 percent increase over 10 years ago (Table 8). This growth occurred despite the shutdown of Iran's 610,000 b/d Abadan refinery, damaged in the war with Iraq. Moreover, large investments were also made in a few countries (Bahrain, Egypt, Kuwait and Saudi Arabia) to upgrade existing facilities, enabling them to manufacture more valuable products.

For the region, petroleum refining is almost as old as crude production, dating back to the completion of plants at Abadan and Suez in 1913, only four or five years after oil was discovered in Iran and Egypt. Until World War II, most of this capacity was in one country, Iran, and one refinery, Abadan, and devoted primarily to one product, fuel oil. The fuel oil found its main outlets in the bunkers of the Royal Navy, operating east of Suez, and in oil tankers carrying the region's crude and product exports.

Table 8

Middle East Crude Oil Refining Capacity

Thousands of Barrels per Day

Country	As of January 1 1974	1984	Change Barrels	%
Bahrain	265	265	–	–
Egypt	180	400	220	122
Iran	665	585	(80)	(12)
Iraq	185	545	360	195
Kuwait*	535	635	100	19
Oman	–	50	50	NMF
Qatar	1	60	59	NMF
Saudi Arabia*	665	875	210	32
United Arab Emirates	–	180	180	NMF
Total	2,496	3,595	1,099	44

*Includes one-half of Neutral Zone.

NMF—No meaningful figure.

Source: Exxon Corporation estimates.

As the region's crude production and economy grew, refining capacity grew as well. Refineries were built in the more populated countries–Egypt, Iran, Iraq and Saudi Arabia–principally to make products from their own crude for their own consumers and, secondarily, for other countries in the region and beyond. In other Middle East countries, notably Bahrain and Kuwait, refineries were built principally to make products for export (with Bahrain having to import crude from Saudi Arabia to supplement its own). In later years, export refineries were also built in Abu Dhabi and Saudi Arabia.

In the last decade, Saudi Arabia became the area's leading refiner–with about half of its capacity (442,000 b/d) at Ras Tanura; additional capacity of 533,000 b/d is scheduled to be completed in 1984. The largest increase was recorded, however, by Iraq, which built two new refineries at Baiji and expanded an existing one. Major additions were made in Egypt, which more than doubled the country's capacity, and in the United Arab Emirates, which joined the ranks of refiners with two new facilities in Abu Dhabi. Although Iran completed new refineries at Tabriz, Isfahan and Lavan, and expanded those at Abadan and Teheran, it showed a small net decrease in capacity during the ten-year period because of Abadan's closing.

While processing crude for export of products has long been a factor in Middle East refining, it became a particularly significant goal in recent years as the region sought to broaden its industrial base.

For many Middle Eastern countries, it was a matter of policy that products from some of their refineries should enter the world market. This export orientation has led to increased capacity coming onstream at a time when world oil demand has been substantially reduced.

One factor that is expected to benefit the Middle East countries is that their new refineries have the advantage of being up-to-date. They are costly facilities which make a range of high value, light products (such as motor gasoline and distillates) that have been in greater demand in importing countries. On the other hand, the transport of products is usually more expensive than transporting crude oil because of vessel size and other supply system constraints.

The drive to export products has not been the only force behind the Middle East's downstream expansion, however. As shown in Table 9, the region's own energy consumption grew vigorously during the last decade, stimulated by the prosperity that came with increased oil export

Table 9

Middle East Oil/Energy Demand
1973 vs. 1983

Thousands of Barrels per Day Oil Equivalent

Fuel	*1973*	*1983*	*% Change*
Motor gasoline*	88	363	312.5
Naphtha	0	10	NMF
Distillate	372	1,016	173.1
Fuel Oil**	698	600	(14.0)
LPG	19	61	221.1
Other	46	194	321.7
Total Petroleum Products	1,223	2,244	83.5
Gas	254	853	235.8
Coal	20	52	160.0
Hydro/Geothermal	56	120	114.3
Total Energy	1,553	3,269	110.5

**Includes aviation gasoline.*

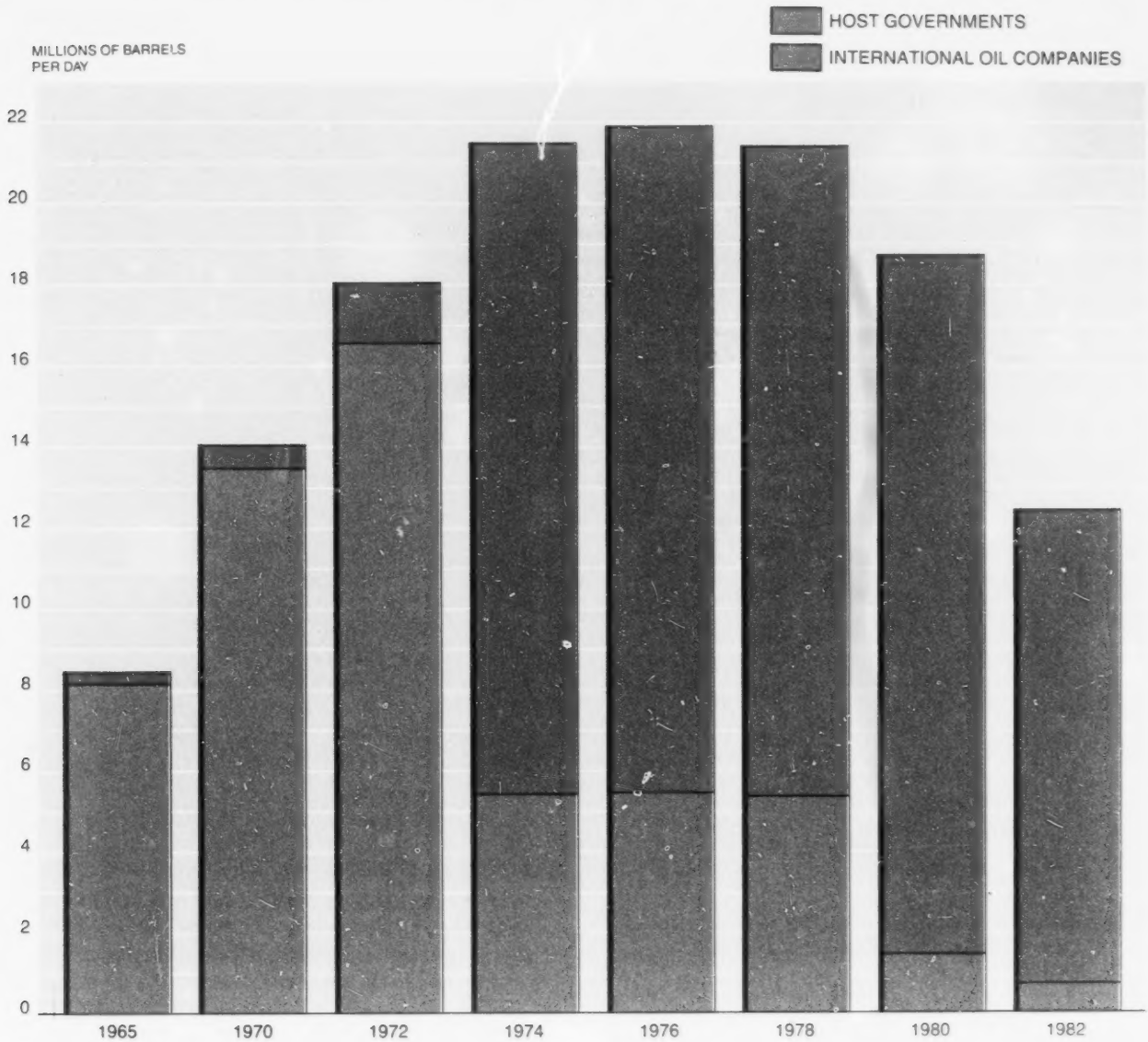
***Includes bunker fuel.*

NMF = No meaningful figure.

Source: Exxon Corporation estimates.

Figure 9

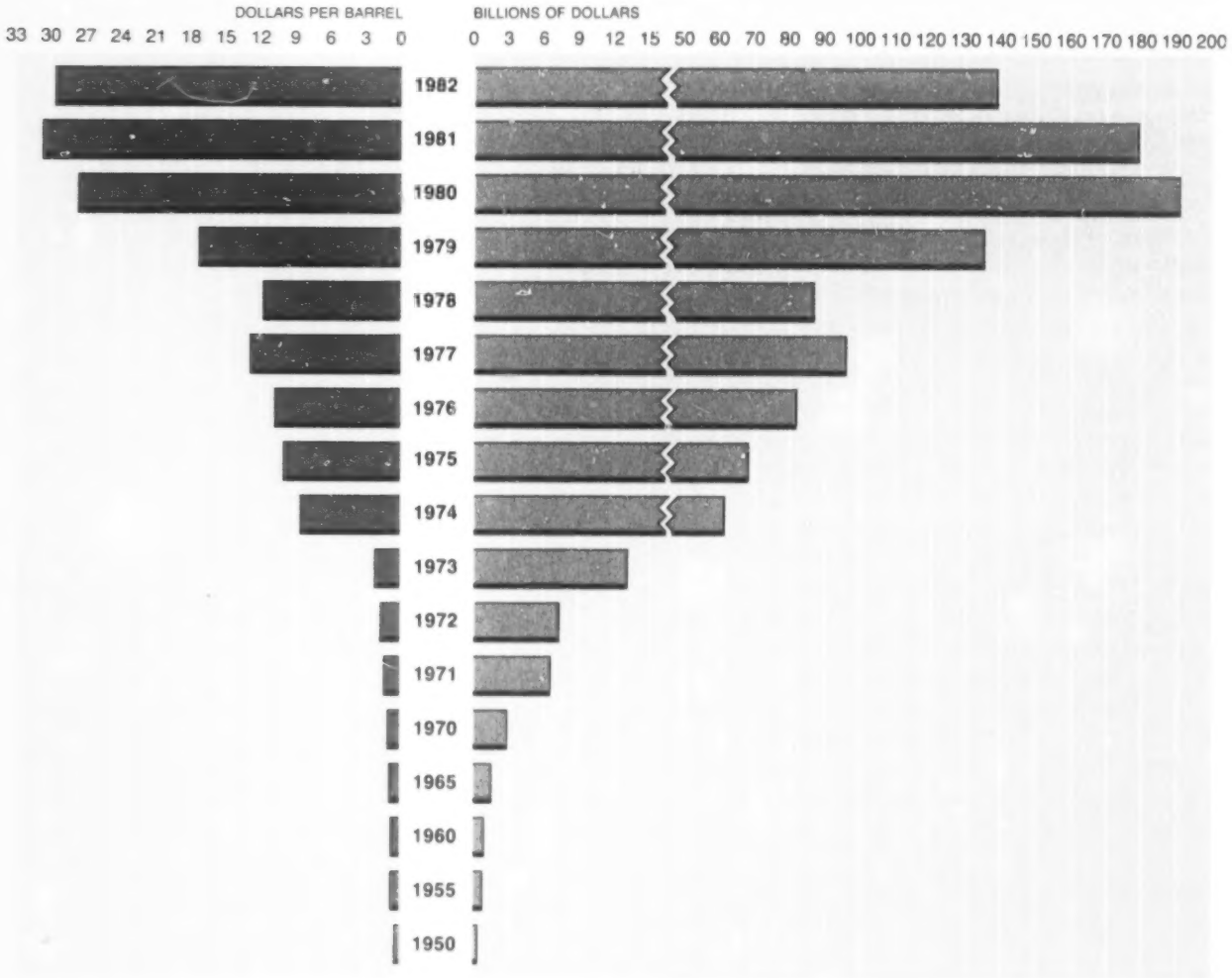
International Oil Companies' Equity Interest in Middle East Crude Oil Production—1965-82



Sources: Annual Statistical Bulletin, Organization of the Petroleum Exporting Countries; Exxon Corporation estimates

Figure 10

Middle East Government Receipts From Oil



Sources: Petroleum Economist, OPEC Oil Report, Second Edition, 1979; Exxon Corporation estimates

revenues and by local product prices established by governments at levels below world market prices. (The Middle East's 7.7 percent annual growth rate in energy demand during the period was well ahead of the non-Communist world's 0.8 percent.) Moreover, the countries of the region have tried also to maintain, or increase, their degree of self-sufficiency in petroleum products.

The largest absolute increases in demand during the decade occurred in distillates and natural gas, reflecting increased fuel requirements associated with intensive industrial development, particularly for electric power, diesel trucks and jet aircraft. Motor gasoline demand grew with the increase in automobile ownership made possible by greater consumer purchasing power. Fuel oil sales dropped, however, largely because of lower requirements for tanker bunker fuel, which has paralleled the decline in crude oil exports. The bunker fuel decline more than offset growing fuel oil demand from large central electric power stations.

Among Middle East countries, Iran has been the region's leading consumer of petroleum products (and of the area's small volume of coal and hydroelectric power). But Iran's share of the region's total domestic oil demand has dropped since 1973 (Table 10). Almost even with Iran has been Saudi Arabia, which, along with Iraq and Egypt, recorded large gains during the decade. Kuwait, in comparison, experienced an absolute as well as a relative decline in its local oil consumption, due primarily to lower demand for ships' bunkers.

In addition to refining and NGL facilities, virtually all of the Middle East producing countries were involved in petrochemicals projects by the latter part of the 1970s (Table 11). These projects reflect the countries' long-term plans to become more than raw material exporters and to utilize their oil and gas resources more fully in their programs to develop significant industrial capacity. Saudi Arabia has the largest number of projects, consisting of joint ventures between several foreign partners and the Saudi Arabian Basic Industries Corporation (SABIC). Some plants are already in operation, while others are in different stages of development.

7 Change and Progress

The discovery and production of oil has had a far-reaching impact on economic and social conditions in the Middle East. The oil companies, particularly in the quarter of a century after World War II, were responsible for major infrastructure projects in the areas of their operations. More important, revenues from oil operations provided the governments with the means for intensive national development programs. This was particularly the case after the dramatic price escalation of the 1970s, which by January 1980 resulted in income per barrel to the producing countries more than 20 times higher than it had been in 1970.

For centuries, trade, animal husbandry and basic agriculture were almost the only means of livelihood in the Middle East. Industry was almost non-existent. Governments and local business lacked capital to improve conditions. In 1932, for example, the total government income in Saudi Arabia was about $2.4 million, derived partly from customs duties and local taxes but principally from a tax collected from pilgrims to Mecca. Five decades later Saudi Arabia's income from oil exceeded $75 billion (Table 12). The impact on living standards has been dramatic. In the United Arab Emirates, for instance, combined private and government consumption expenditures per capita had risen to almost $15,000 by 1982, about one-third higher than in the U.S.

Table 10

Comparison of Middle East Countries' Domestic Petroleum Product Demand

Country	*Percent of Region Total* 1973	1983
Egypt	13	16
Iran	36	31
Iraq	6	11
Kuwait	12	5
Saudi Arabia	22	30
Others	11	7

Source: Exxon Corporation estimates

Text continues on page 40

Table 11

Examples of Middle East Industrial Projects

ABU DHABI	*Description*	*Status*
Ruwais Fertilizer Industries Co./ADNOC, CFP	1,000 t/d ammonia, 1,500 t/d urea	Start-up in 1983.
BAHRAIN		
Aluminium Bahrain/Bahrain, Saudi Governments, Kaiser, Breton Investments	170,000 t/y aluminum	Start-up in 1971.
Gulf Petrochemical Industries Co./Bahrain, Kuwait, Saudi Governments	1,000 t/d ammonia, 1,000 t/d methanol	Construction contract awarded–completion 1985.
DUBAI		
Dubai Aluminum Co./ Government, Alusmelter Holdings	135,000 t/y aluminum	Start-up in 1979.
IRAN		
Iran-Japan Petrochemical Co./Government, Iran Chemical Development Co.	300,000 t/y ethylene, producing low-density polyethylene (LDPE) ethylene dichloride aromatics, etc.	85% complete at end of 1978 (held up because of war).
Razi Petro-Chemical Co./ Government	1,000 t/d ammonia, 1,000 t/d urea and other chemicals	Expanded 1978.
Iran Fertilizer Co./ Government	Expansion to 1,200 t/d ammonia; 1,500 t/d urea	Start-up in 1984.
National Iranian Copper Industries/Government	150,000 t/y copper	Start-up in 1982.
IRAQ		
Petrochemical-Basrah/Government	Ethylene complex producing polyvinyl chloride, LDPE, high-density polyethylene (HDPE), caustic, etc.	Project complete. Start-up delayed by war.
Fertilizer-Khor al-Zubair/ Government	2,000 t/d ammonia, 3,200 t/d urea.	Start-up in 1979.
Iron & Steel-Khor al-Zubair/ Government	1.2 million t/y sponge iron, 400,000 t/y finished steel	Start-up in 1978.

KUWAIT		
Petrochemical Industries Co./ Government	Expansion to provide ammonia capacity of 1 million t/y	Completion scheduled for late 1984.
OMAN		
Oman Mining Co./Government	20,000 t/y copper	Start-up in 1983.
QATAR		
Qatar Petrochemical Co./ Government, CdF Chimie	280,000 t/y ethylene, producing LDPE	Start-up in 1980.
Qatar Fertilizer Co./Government, Norsk Hydro	Ammonia/urea expanded to 2,000 t/d capacity	Expanded 1979.
Qatar Steel Co./Government, Kobe Steel, Tokyo Boeki	400,000 t/y steel	Start-up in 1978.
SAUDI ARABIA		
Saudi Petrochemical Co./ SABIC, Shell	650,000 t/y ethylene, producing styrene, ethylene dichloride, ethanol	Start-up in 1984.
Arabian Petrochemical Co./ SABIC	500,000 t/y ethylene, producing ethylene glycol	Construction contract awarded–completion 1985.
Al Jubail Petrochemical Co./ SABIC, Exxon	260,000 t/y LDPE	Start-up in 1984.
Saudi Methanol Co./SABIC, Japanese group	600,000 t/y methanol	Start-up in 1983.
National Methanol Co./SABIC, Texas Eastern, Celanese	650,000 t/y methanol	Start-up in 1984.
Eastern Petrochemical Co./ SABIC, Japanese group	300,000 t/y ethylene glycol, 130,000 t/y LDPE	Construction in progress–completion 1985.
Al Jubail Fertilizer Co./SABIC, Taiwan Fertilizer Corp.	1,600 t/d urea, 1,000 t/d ammonia	Start-up in 1983.
Saudi Iron and Steel Co./SABIC, Korf-Stahl	800,000 t/y direct reduction steel plant	Start-up in 1982.
Saudi Yanbu Petrochemical Co./SABIC, Mobil	450,000 t/y ethylene, producing LDPE, HDPE, ethylene glycol	Construction in progress–completion 1985.

Company/*Principal Owners*
t/d = tons per day; t/y = tons per year.

Table 12

Middle East Nations Compared: People, Area and Revenue From Oil

Country	Area[1] Square Miles	Population[2] Millions	Government Revenue from Oil[3] In Millions of U.S. Dollars				Government Oil Revenue
	1982	1982	1950	1965	1979	1982	$ Per Capita 1982
Bahrain	231	.37	2	17	780	1,300	3,514
Iran	636,367	40.24	45	522	19,090	17,250	429
Iraq	167,568	14.00	30	375	21,290	10,100	721
Kuwait*	7,780	1.56	12	671	16,780	8,600	5,513
Oman	82,000	0.95	–	–	2,000	4,100	4,316
Qatar	4,000	0.26	1	69	3,590	4,000	15,385
Saudi Arabia*	873,972	9.68	110	655	58,650	75,800	7,831
United Arab Emirates	33,378	0.79	–	33	12,860	15,500	19,620
Total Gulf Area	1,805,296	67.85	200	2,342	135,040	136,650	2,014
Egypt	386,198	44.67	2	40	760	2,100	47
Total Middle East	2,191,494	112.52	202	2,382	135,800	138,750	1,233

*Includes one-half of Neutral Zone.

Sources:

1 The Times Atlas of the World.

2 International Monetary Fund, International Financial Statistics.

3 Data based on exports of crude, refined products and natural gas liquids.

Text continues from page 37

When private oil companies entered the region, first to explore and later to build producing, shipping and refining facilities, they found local labor willing but untrained. In those early years the companies had to import both the skill and the technology needed to carry on operations, while local workers received on-the-job training and often were sent abroad for higher technical education.

Besides importing skilled workers for direct activities, the operating companies had to establish service enterprises for a wide range of supporting activities. They found themselves in food supply, utilities, refuse collection, and hardware and clothing–all based on massive imports. The companies provided communities with roads, agricultural projects and irrigation, health care, sanitation, schools, banking and housing. Over the decades, however, as the economies of the Middle Eastern nations expanded, governments and local private enterprise took over more of these activities.

Governments are now using their revenues and expanded capabilities to develop large-scale agricultural and industrial projects with the aim of establishing diversified economies that will support future generations. In support of these efforts, they are greatly extending their educational and health care facilities and expanding the infrastructure of roads, power systems, communications networks, and fresh water supplies.

Changes in the economic conditions and quality of life in the Middle East have been remarkably swift and in some respects unsettling. But there is an enduring foundation of stability in these countries. Their leaders place great value on the traditions of their native cultures. They appear determined to nurture the old as well as the new.

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